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WILDLIFE INVENTORY, CRAIG MOUNTAIN, IDAHO

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SUMMARY

Wildlife distribution and abundance were studied at Craig Mountain, Idaho, during 1993 and 1994 to establish baseline information as part of the wildlife mitigation agreement for construction of Dworshak reservoir. Inventory efforts were designed to (1) document distribution and abundance of 4 target species used in the Dworshak impact assessment: pileated woodpecker, yellow warbler, black-capped chickadee, and river otter, (2) determine distribution and abundance of rare animals, and (3) determine presence and relative abundance of all other species except deer and elk.

Two hundred and one wildlife species were observed during the survey period. Most were residents or used the area seasonally for breeding or wintering. New distribution or breeding records were established for at least 6 species.

Pileated woodpeckers were observed at 35% of 134 survey points in upland forest. Estimated densities were between 0 - 0.08 birds/ha and averaged 0.02 birds/ha. Yellow warblers were found in riparian areas and shrubby draws below 3500 ft elevation, and were most abundant in white alder plant communities. Average estimated densities ranged from 0.2 - 2.1 birds/ha. Black-capped chickadees were found in riparian and mixed tall shrub vegetation at all elevations. Average estimated densities ranged from 0 - 0.7 birds/ha. River otters and suitable otter denning and foraging habitat were observed along the Snake and Salmon rivers.

Fifteen special status animals (threatened, endangered, candidate, sensitive, and/or state species of special concern) were observed at Craig Mountain. This included 3 amphibians, 1 reptile, 8 birds, and 3 mammals. Another 5 special status species potentially occur, although they were not documented in this study. Most special status species were rare on Craig Mountain with the exception of spotted frogs and western toads which occurred commonly in wetlands, ponds, and streams. Townsend's big-eared bats and fringed myotis, both C2 candidates for listing as threatened or endangered, also appeared to be relatively abundant at Craig Mountain.

Ecosystem-based wildlife management issues are identified. A monitoring plan is presented for assessing effects of mitigation activities on target species, special status animals, and selected other wildlife species.

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INTRODUCTION

In 1992, the Bonneville Power Administration (BPA) purchased the Craig Mountain Wildlife Mitigation Area as partial mitigation for wildlife and wildlife habitat eliminated by the 1971 construction of Dworshak Dam on the North Fork Clear-water River in north-central Idaho. The Idaho Department of Fish and Game (IDFG), BPA, and the Nez Perce Tribe (NPT) agreed to provide for the protection and enhancement of wildlife habitat through management of this area as part of the wildlife mitigation agreement for Dworshak Dam (Hansen and Martin 1989, BPA et al. 1992). Wildlife surveys were conducted over a period of approximately 21 months in order to provide baseline information to be used in development of a management plan by IDFG.

OBJECTIVES

The objectives of this project (IDFG 1992) were to survey the Craig Mountain Wildlife Mitigation Area to:

1. Determine distribution and abundance of the following target species:

   pileated woodpecker (*Dryocopus pileatus*)
   yellow warbler (*Dendroica petechia*)
   black-capped chickadee (*Parus atricapillus*)
   river otter (*Lutra canadensis*)

2. Determine distribution and abundance of rare wildlife.

3. Determine presence and relative abundance of other birds, mammals, reptiles, and amphibians with the exception of deer and elk. Deer and elk were covered separately (IDFG, unpubl. data).

The project was designed to provide an inventory of species presence, and in some instances abundance, and to identify species or areas that deserve special management consideration. It provides baseline data that can be monitored through time and it gives a general overview of the wildlife communities in this area. This report also identifies some wildlife management issues, areas where additional information is needed, and suggests topics and methods for future monitoring and research.

ACKNOWLEDGMENTS

I am grateful to the many biologists and students who assisted with this study. Over 40 individuals were directly involved in collecting or analyzing the data, and many'others assisted indirectly. I would especially like to thank my supervisors Chuck Harris and Wayne

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STUDY AREA

The Craig Mountain Wildlife Mitigation Area encompasses approximately 60,000 acres located in north-central Idaho from just north of the confluence of the Salmon and Snake Rivers (45° 51 'N) to about 1 mi south of Waha Lake (46° 11 'N) and from just east of the Snake River (116° 53'E) to about 1 mi east of Deer Creek (116° 39'E). The area is part of a region known as Craig Mountain or the Craig Mountains in the southern part of Nez Perce County and southwestern Lewis County (Fig. 1). The mitigation area contains Idaho Department of Lands (IDL), NPT, BLM, and private inholdings. It is adjacent to the Nature Conservancy Garden Creek Preserve and the IDFG Craig Mountain Wildlife Management Area.

Craig Mountain is located at the northern end of the Wallowa-Snake physiographic province (Johnson and Simon 1987). Rugged breaks rise from the Salmon and Snake Rivers (elevation ca. 820 ft) to a forested plateau approximately.4500 to 5395 ft elevation, creating diverse climatic conditions, and plant and wildlife communities. In general, climate is temperate continental - cool summer phase (Trewartha 1968), characterized by light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide ranges in temperature. Climatic conditions are moderated by marine air moving up the Columbia River from the Pacific Ocean. Hot summers (mean temperatures of 80 - 90° F, with maximums often > 100° F) and mild winters (mean temperatures $\geq$ 30° F) characterize weather at lower elevations in the river canyons; mid-elevations and the upper plateau are cooler, with moderately severe winters and warm summers. Heaviest precipitation occurs

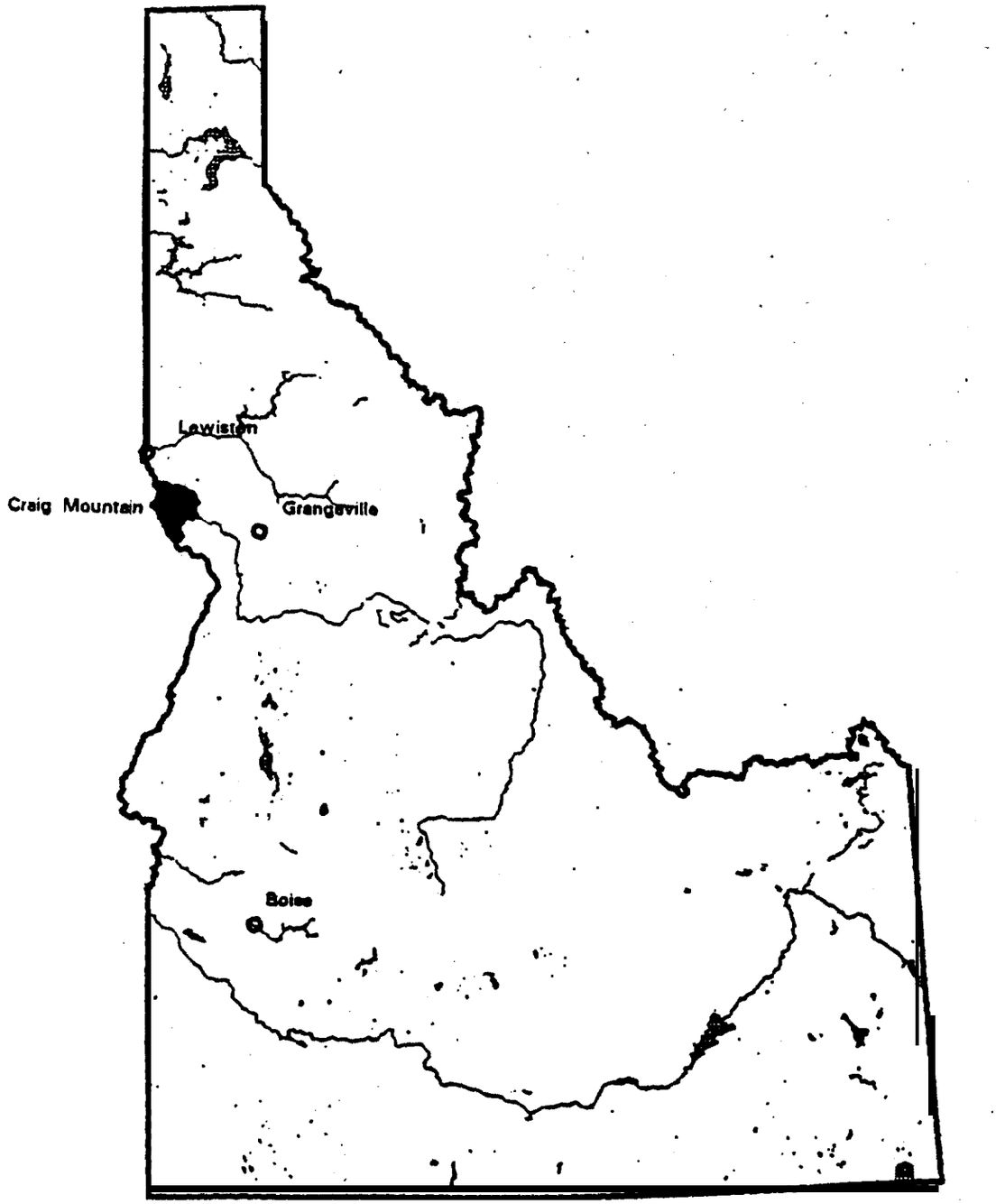

Figure 1. Location of Craig Mountain, Idaho.

during the winter months, and in May and June. At lower elevations about half the total precipitation occurs during the winter months, at higher elevations as much as ⅔ of the precipitation occurs as snow during the winter (Johnson and Simon 1987). Precipitation is positively correlated with elevation (U. S. Department of Agriculture 1979), with annual minimums of 10 inches at the lowest elevations in the river canyons. Snowfall is estimated at over 100 inches at upper elevations (Barker 1976).

Geology is dominated by Columbia River basalts with steep river canyons and benches formed by differential erosion by the Snake and Salmon Rivers. Uplift and erosion have also combined to expose older volcanic and sedimentary rocks with some intrusions of tertiary granitic rocks of the Idaho Batholith (Asherin and Claar 1976). Soils vary widely, but are primarily residual material derived from bedrock or colluvial materials, ash deposited by eruptions of Mt. Mazama and Glacier Peak, wind-blown loess from Washington's channeled scablands deposited during the Pleistocene, or a mixture of residual and deposited soils over older buried soil material. The soils containing deposited material have significantly higher productivity than those that are completely residual in origin (Johnson and Simon 1987).

Vegetation of upper elevations at Craig Mountain is characterized as gently rolling forested uplands dominated by grand *fir (Abies grandis)* habitat types (Cooper et al. 1987). This forested plateau breaks into canyons at roughly the 4,800 - 4,600 ft contour (Mancuso and Moseley 1994). The canyons are dominanted by bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*) grassland communities. Invasion by noxious *weeds* such *as* yellow *star* thistle *(Centaurea solstitialis)* and scotch thistle (*Onopordum acanthium*) is extensive, particularly in disturbed areas (Nieman 1987, Mancuso and Moseley 1994). On mesic aspects the grasslands are interspersed with shrubfields, including ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpus albus*), rose *(Rosa* spp.), and ocean spray (*Holodiscus discolor*). Stringers of shrubs are also associated with canyon draws and intermittent streams. Low elevation draws are commonly dominated by hackberry (*Celtis reticulata*). Riparian stringers along lst-, 2nd-, and 3rd-order tributaries to the Snake and Salmon Rivers *are* predominantly *white* alder *(Alms rhombifolia)* communities below 2,500 ft elevation and mixed shrubs or conifers at higher elevations. Canyon forests are typically Douglas-fir (*Pseudotsuga menziesii*), most commonly in the Douglas-fir/ninebark habitat type (Cooper et al. 1987), and are restricted to steep, northerly aspects from 2,000 - 4,800 ft elevation (Mancuso and Moseley 1994).

Most of the Craig Mountain area has been selectively logged and/or grazed by cattle. A few historical mine sites are scattered on the area, but no mining claims are currently active. Recreational use is high and includes upland bird and big game hunting, mountain biking, horseback riding, off-highway vehicle use, and snowmobiling.

METHODS

An initial list of vertebrate species, excluding fish, that might potentially occur on the area, was developed from information collected by surrounding land managers including the BLM, The Nature Conservancy, Washington Department of Wildlife, Oregon Department of

Fish and Wildlife, U. S. Forest Service (USFS) Hells Canyon National Recreation Area, and from regional publications (Asherin and Claar 1976, Stauffer et al. 1979, Saab and Groves 1992, Stephens and Sturts 1991, Groves 1989, Nussbaum et al. 1983). Searches of the Idaho Conservation Data Center database, Oregon Natural Heritage Program database, and University of Idaho and Idaho State University museums were also conducted. The resulting species list was reviewed by ornithologists, mammologists, and herpetologists at the University of Idaho and Idaho State University. Based on this information, 179 bird, 65 mammal, 10 amphibian, and 14 reptile species (a total of 268 vertebrate species other than fish) were estimated to potentially occur on the study area (Appendix A). This included 31 special status species: state species of special concern, U. S. Fish and Wildlife Service USFWS) threatened, endangered or candidate species, and/or USFS or BLM sensitive species (Moseley and Groves 1992).

In order to verify species occurence, extensive multi-species surveys that would potentially detect rare and target species were conducted. Emphasis was placed on community-level inventory obtaining relative estimates of abundance for many species, rather than determining accurate abundances for a few species. A few specialized surveys targeted rare species unlikely to be discovered in general surveys.

Seven major wildlife habitat types have been identified for Craig Mountain (Mancuso and Moseley 1994): riparian, wet meadow, grassland, upland forest, canyon forest, shrubby draws, and aquatic. These classifications were used to categorize most wildlife-habitat associations. More detailed vegetation data were collected at many inventory points (Mancuso and Moseley 1994, Mancuso and Cassirer, unpubl. data).

Permanently-marked monitoring points were established at over 300 survey sites with metal rebar or fenceposts. Many survey and most monitoring points were located to within 3-5 m using a Global Positioning System. Location data were projected using the NAD27-CONUS geodetic datum. Specific methodology is described in the sections that follow. Copies of all data sheets, computer data files, and maps of monitoring locations are located at the IDFG Natural Resources Policy Bureau (Conservation Data Center) and at the Lewiston regional office.

Inventory results

One hundred eighty-seven wildlife species (47 mammals, 123 birds, 10 reptiles, and 7 amphibians) were documented as residents at Craig Mountain, or were observed using the area seasonally as a wintering or breeding site. This included 7 introduced species: bullfrog, gray partridge, chukar, wild turkey, California quail, rock dove, and european starling. A feral peacock was also observed in lower China Creek. Fifteen bird species were observed only during migration, primarily along the river corridors (Table 1).

Season of use was characterized as resident, breeding, wintering, migration, accidental, or transient based on life history information and timing of observations (Table 1). A number of bird species are represented by both migratory and resident individuals. These species were classified as resident.

Table 1. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
AMPHIBIANS	**AMPHIBIA**		
Salamanders	**Caudata**		
Long-toed salamander	*Ambystoma*	*macrodactylum*	Resident
Frogs and toads	**Anura**		
Western toad	*Bufo*	*boreas*	Resident
Pacific tree frog	*Pseudacris*	*regilla*	Resident
Tailed frog	*Ascaphus*	*truei*	Resident
Great Basin spadefoot toad	*Spea*	*intermontana*	Resident
Bullfrog	*Rana*	*catesbeiana*	Resident
Spotted frog	*Rana*	*pretiosa*	Resident
REPTILES	**REPTILIA**		
Lizards	**Lacertilia**		
Western fence lizard	*Sceloporus*	*occidentalis*	Resident
Western skink	*Eumeces*	*skiltonianus*	Resident
Snakes	**ophidia**		
Rubber boa	*Charina*	*bottae*	Resident
Racer	*Coluber*	*constrictor*	Resident
Ringneck snake	*Diadophis*	*punctatus*	Resident
Night snake	*Hypsiglena*	*torquata*	Resident
Gopher snake	*Pituophis*	*catenifer*	Resident
Western terrestrial garter snake	*Thamnophis*	*elegans*	Resident
Common garter snake	*Thamnophis*	*sirtalis*	Resident
Western rattlesnake	*Crotalus*	*viridis*	Resident

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
BIRDS	**AVES**		
Wading birds	**Ciconiiformes**		
American white pelican	*Pelecanus*	*erythrorhynchos*	Transient
Great blue heron	*Ardea*	*herodias*	Resident
Waterfowl	**Anseriformes**		
Canada goose	*Branta*	*canadensis*	Resident
Mallard	*Anas*	*platyrhynchos*	Migration
American wigeon	*Anas*	*americana*	Migration
Northern pintail	*Anas*	*acuta*	Migration
Green-winged teal	*Anas*	*crecca*	Migration
Northern shoveler	*Anas*	*clypeata*	Migration
Wood duck	*Aix*	*sponsa*	Migration
Lesser scaup	*Aythya*	*affinis*	Migration
Harlequin duck	*Histrionicus*	*histrionicus*	Migration
Common goldeneye	*Bucephala*	*clangula*	wintering
Bufflehead	*Bucephala*	*albeola*	wintering
Common merganser	*Mergus*	*merganser*	Resident
Vultures and diurnal raptors	**Falconiformes**		
Turkey vulture	*Cathartes*	*aura*	Breeding
Osprey	*Pandion*	*haliaetus*	Migration
Bald eagle .	*Haliaeetus*	*leucocephalus*	wintering
Northern harrier	*Circus*	*cyaneus*	Breeding
Sharp-shinned hawk	*Accipiter*	*striatus*	Breeding
Cooper's hawk	*Accipiter*	*cooperii*	Resident
Northern goshawk	*Accipiter*	*gentilis*	Resident
Swainson's hawk	*Buteo*	*swainsoni*	Breeding

Table **1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.**

Name	Scientific name		Season of use
Red-tailed hawk	***Buteo***	***jamaicensis***	Resident
Golden eagle	***Aquila***	***chrysaetos***	Resident
American kestrel	***Falco***	***sparverius***	Resident
Prairie falcon	***Falco***	***mexicanus***	Resident
Gallinaceous birds(Upland game)	**Galliformes**		
Gray Partridge	***Perdix***	***perdix***	Resident
Chukar	***Alectoris***	***chukar***	Resident
Blue grouse	***Dendragapus***	***obscurus***	Resident
Ruffed grouse	***Bonasa***	***umbellus***	Resident
Wild turkey	***Meleagris***	***gallopavo***	Resident
California quail	***Callipepla***	***californica***	Resident
Mountain quail	***Oreortyx***	***pictus***	Resident
Peacock	***Paw***	***spp.***	Resident
Shorebirds	**Charadriiformes**		
Killdeer	***Charadrius***	*vociferous*	Resident
Spotted sandpiper	*Actitus*	***macularia***	Resident
Common snipe	***Gallinago***	***gallinago***	Breeding
Pigeon-like birds	**Columbiformes**		
Rock dove	***Columba***	*livia*	Resident
Mourning dove	***Zenaida***	***macroura***	Breeding
Owls	**Strigiformes**		
Short-eared owl	*Asio*	***flammeus***	Migration
Wcstem screech-owl	***Otus***	***kennicotti***	Resident
Flammulated owl	***Otus***	***flammeolus***	Breeding
Great-horned owl	***B u b o***	*virginianus*	Resident
Northern pygmy-owl	***Glaucidium***	***gnoma***	Resident

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Barred owl	*Strix*	*varia*	Resident
Great gray owl	*Strix*	*nebulosa*	Resident
Snowy owl	*Nyctea*	*scandiaca*	Transient
Northern saw-whet owl	*Aegolius*	*acadicus*	Resident
Goatsuckers	**Caprimulgiformes**		
Common nighthawk	*Chordeiles*	*minor*	Breeding
Common poorwill	*Phalenoptilus*	*nuttallii*	Breeding
Swifts and hummingbirds	**Apodiformes**		
Vaux's swift	*Chaetura*	*vauxi*	Breeding
Calliope hummingbird	*Stellula*	*calliope*	Breeding
Rufous hummingbird	*Selasphorus*	*rufus*	Breeding
Trogons	**Trogoniformes**		
Belted kingfisher	*Ceryle*	*alcyon*	Breeding
Woodpeckers	**Piciformes**		
Lewis' woodpecker	*Melanerpes*	*lewis*	Breeding
Williamson's sapsucker	*Sphyrapicus*	*thyroideus*	Breeding
Red-naped sapsucker	*Sphyrapicus*	*nuchalis*	Breeding
Downy woodpecker	*Picoides*	*pubescens*	Resident
Hairy woodpecker	*Picoides*	*villosus*	Resident
White-headed woodpecker	*Picoides*	*albolarvatus*	Resident
Northern flicker	*colaptes*	*auratus*	Resident
Pileated woodpecker	*Dryocopus*	*pileatus*	Resident
Passerines (Songbirds)	**Passeriformes**		
Olive-sided flycatcher	*Contopus*	*borealis*	Breeding
Western wood-pewee	*Contopus*	*sordidulus*	Breeding
Hammond's flycatcher	*Empidonax*	*hammondii*	Breeding

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Dusky flycatcher	*Empidonax*	*oberholseri*	Breeding
Cordilleran flycatcher	*Empidonax*	*occidentalis*	Breeding
Say's pheobe	*sayomis*	*saya*	Breeding
Western kingbird	*Tyrannus*	*verticalis*	Breeding
Eastern kingbird	*Tyrannus*	*tyrannus*	Breeding
Homed lark	*Eremophila*	*alpestris*	Resident
Violet-green swallow	*Tachycineta*	*thalassina*	Breeding
Northern rough-winged swallow	*Stelgidopteryx*	*serripennis*	Breeding
Cliff swallow	*Hirundo*	*pyrrhonota*	Breeding
Ram swallow	*Hirundo*	*rustica*	Breeding
Gray jay	*Perisoeus*	*canadensis*	Resident
Stellcr's jay	*Cyanocitta*	*stelleri*	Resident
Clark's nutcracker	*Nucifraga*	*columbiana*	Resident
Black-billed magpie	*Pica*	*pica*	Resident
American crow	*Corvus*	*brachyrhnchos*	Resident
Common raven	*Corvus*	*corax*	Resident
Black-capped chickadee	*Parus*	*atricaphillus*	Resident
Mountain chickadee	*Parus*	*gambeli*	Resident
Chestnut-backed chickadee	*Parus*	*rufescens*	Resident
Red-breasted nuthatch	*Sitta*	*canadensis*	Resident
White-breasted nuthatch	*Sitta*	*carolinensis*	Resident
Pygmy nuthatch	*Sitta*	*pygmae*	Resident
Brown creeper	*Certhia*	*americana*	Resident
Rock wren	*Salpinctes*	*obsoletus*	Resident
Canyon wren	*Catherpes*	*mexicanus*	Resident
House wren	*Troglodytes*	*aedon*	Breeding

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Winter wren	*Troglodytes*	*troglodytes*	Resident
American dipper	*Cinclus*	*mexicanus*	Resident
Golden-crowned kinglet	*Regulus*	*satrapa*	Resident
Ruby-crowned kinglet	*Regulus*	*calendula*	Breeding
Western bluebird	*Sialia*	*mexicana*	Breeding
Mountain bluebird	*Sialia*	*currucoides*	Breeding
Townsend's solitaire	*Myadestes*	*townsendi*	Breeding
Veery	*Catharus*	*fuscescens*	Breeding
Swainson's thrush	*Catharus*	*ustulatus*	Breeding
Hermit thrush	*Catharus*	*guttatus*	Breeding
American robin	*Turdus*	*migratorius*	Resident
Varied thrush	*Ixoreus*	*naevius*	Resident
Bohemian waxwing	*Bombycilla*	*garrulus*	wintering
Cedar waxwing	*Bombycilla*	*cedorum*	Breeding
European starling	*Sturnus*	*vulgaris*	Resident
Solitary vireo	*Vireo*	*solitarius*	Breeding
Warbling vireo	*Vireo*	*gilvus*	Breeding
Red-eyed vireo	*Vireo*	*olivaceus*	Breeding
Orange-crowned warbler	*Vermivora*	*celata*	Breeding
Nashville warbler	*Vermivora*	*ruficapilla*	Breeding
Yellow warbler	*Dendroica*	*petechia*	Breeding
Yellow-rumped warbler	*Dendroica*	*coronata*	Resident
Townsend's warbler	*Dendroica*	*townsendi*	Breeding
MacGillivray's warbler	*Oporornis*	*tolmiei*	Breeding
Wilson's warbler	*Wilsonia*	*pusilla*	Breeding
Yellow-breasted chat	*Icteria*	*virens*	Breeding

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Wcstcm tanager	*Piranga*	*ludoviciana*	Breeding
Black-headed grosbeak	*Pheuticus*	*melanocephalus*	Breeding
Lazuli bunting	*Passerina*	*amoena*	Breeding
Rufous-sided towhee	*Pipilo*	*erythrophthalmus*	Resident
Chipping sparrow	*Spizella*	*passerina*	Breeding
Vesper sparrow	*Pooecetes*	*gramineus*	Breeding
Lark sparrow	*Chondestes*	*grammacus*	Breeding
Song sparrow	*Melospiza*	*melodia*	Resident
Dark-eyed j unco	*Junco*	*hyernalis*	Resident
Red-winged blackbird	*Agelaius*	*phoeniceus*	Breeding
Western meadowlark	*Sturnella*	*neglecta*	Resident
Brown-head@ cowbird	*Molothrus*	*ater*	Breeding
Northern oriole	*Icterus*	*galbula*	Breeding
Pine grosbeak	*Pinicola*	*enucleator*	Wintering
Cassin's finch	*Carpodacus*	*cassinii*	Resident
Rosy finch	*Leucosticte*	*arctoa*	Migration
Red crossbill	*Loxia*	*curvirostra*	Resident
Pine siskin	*Carduelis*	*pinus*	Resident
American goldfinch	*Carduelis*	*tristis*	Resident
Evening grosbeak	*Coccothrastes*	*vespertinus*	Resident
MAMMALS	**MAMMALIA**		
Shrews	**Insectivora**		
Masked shrew	*Sorex*	*cinereus*	Resident
Vagrant shrew	*Sorex*	*vagrans*	Resident
Dusky shrew	*Sorex*	*monticolus*	Resident

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Merriam's shrew	*Sorex*	*merriami*	Resident
Water shrew	*Sorex*	*palustris*	Resident
Bats	**Chiroptera**		
Little brown myotis	*Myotis*	*lucifugus*	Resident
Yuma myotis	*Myotis*	*yumanensis*	Resident
Long-eared myotis	*Myotis*	*evotis*	Resident
Long-legged myotis	*Myotis*	*volans*	Resident
Fringed myotis	iuyotis	*thysanodes*	Resident
Silver-haired bat	*Lasionycteris*	*noctivagans*	Resident
Western pipistrelle	*Pipstrellus*	*hesperus*	Resident
Big brown bat	*Eptesicus*	*fuscus*	Resident
Hoary bat	*Lasiurus*	*cinereus*	Resident
Townsend's big-eared bat	*Plecotus*	*townsendii*	Resident
Rabbits and hares	**Lagomorpha**		
Mountain cottontail	*Sylvilagus*	*nuttallii*	Resident
Snowshoe hare	*Lepus*	*americanus*	Resident
Rodents	**Rodentia**		
Columbian ground squirrel	*Spermophilus*	*columbianus*	Resident
Golden-mantled ground squirrel	*Spermophilus*	*lateralis*	Resident
Red squirrel	*Tamiasciurus*	*hudsonicus*	Resident
Northern pocket gopher	*Thomomys*	*talpoides*	Resident
Beaver	*Castor*	*canadensis*	Resident
Great basin pocket mouse	*Perognathus*	*parvus*	Resident
Deer mouse	*Peromyscus*	*maniculatus*	Resident
'Bushy-tailed woodrat	*Neotoma*	*cinerea*	Resident

Table 1 cont'd. Wildlife species observed at Craig Mountain, Idaho, 1993 - 1994.

Name	Scientific name		Season of use
Southern red-backed vole	*Clethrionomys*	*gapperi*	Resident
Montane vole	*Microtus*	*montanus*	Resident
Long-tailed vole	*Microtus*	*longicaudus*	Resident
Muskrat	*Ondatra*	*zibethicus*	Resident
Western jumping mouse	*Zapus*	*princeps*	Resident
Porcupine	*Erethiwn*	*dorsatum*	Resident
Carnivores	**Carnivora**		
Coyote	*Canis*	*latrans*	Resident
Black bear	*Ursus*	*americanus*	Resident
Raccoon	*Procyon*	*lotor*	Resident
Ermine	*Mustela*	*erminea*	Resident
Long-tailed weasel	*Mustela*	*frenata*	Resident
Mink	*Mustela*	*vison*	Resident
Badger	*Taxidea*	*taxus*	Resident
Striped skunk	*Mephitis*	*mephitis*	Resident
River otter	*Lutra*	*canadensis*	Resident
Mountain lion	*Felis*	*concolor*	Resident
Bobcat	*Felis*	*rufus*	Resident
Ungulates	**Artiodactyla**		
Elk	*Cervus*	*elaphus*	Resident
Mule deer	*Odocoileus*	*hemionus*	Resident
Moose	*Alces*	*alces*	Resident
White-tailed deer	*Odocoileus*	*virginianus*	Resident
Bighorn sheep	*Ovis*	*canadensis*	Resident

Discussion

The number of wildlife species occurring on the Craig Mountain mitigation area is primarily a reflection of the habitat diversity produced by the large elevational gradient and the location of Craig Mountain in a climatic and vegetative ecotone between the Hells Canyon and Palouse provinces (Mancuso and Moseley 1994). Approximately 73% of the 268 wildlife species originally estimated to potentially occur in the area (Appendix A) were observed during this inventory project (birds - 74%, mammals - 72%, reptiles - 71%, amphibians - 70%). New breeding records or range extensions were recorded for at least 6 species (Table 2). The majority of species not observed probably do not occur at Craig Mountain. However, some uncommon and/or inconspicuous species, and species not targeted by surveys were undoubtedly missed. New species continued to be recorded throughout the inventory period indicating that not all species were located. In particular, wintering and migrating birds were not targeted in any surveys.

The following sections provide more detailed information on selected species and species groups. All information was collected in a manner to allow input into a Geographic Information System (GIS) database. Future use of GIS analysis and mapping displays will assist with understanding and interpreting these data. For instance, distribution of species richness, distribution and potential distribution of rare species, and juxtaposition of habitats can be assessed and presented in this format. Information at this (landscape) scale should be helpful in planning management activities by accounting for the role of individual habitats and management units in the ecosystem (Franklin and Forman 1987, Hutto et al. 1993).

Table 2. Selected range extensions and breeding records documented at Craig Mountain, 1993 and 1994.

Species	Record type
Night snake	Range extension
Flammulated owl	breeding[1]
Great gray owl	Breeding[2]
Williamson's sapsucker	Breeding
Poorwill	breeding
Merriam's shrew	Range extension

1 breeding = circumstantial evidence of breeding (singing male in suitable habitat).

2 Breeding = confirmed evidence of breeding (nest or fledglings observed).

TARGET SPECIES

Target species are animals selected in the Dworshak wildlife impact assessment as high priority to federal, state, or tribal wildlife programs, or as indicators of habitats impacted by construction of Dworshak dam (Hansen and Martin 1989). Based on Habitat Evaluation Procedures (HEP), Habitat Suitability, Index (HSI) models, habitats for the 6 target species used in the Craig Mountain mitigation project: pileated woodpecker, yellow warbler, black-capped chickadee, river otter, elk, and white-tailed deer, were all estimated to have been negatively affected by the construction of Dworshak dam (Hansen and Martin 1989). Baseline information on the 3 target bird species at Craig Mountain was collected during breeding bird surveys conducted from March - July, 1993 and 1994. A river survey was conducted for river otter in 1993, and incidental sightings were also collected. Elk and white-tailed deer were addressed in separate surveys (IDFG, unpubl. data).

PILEATED WOODPECKER

Pileated woodpeckers were used as indicators of mature or old growth coniferous forest habitats in the Dworshak dam wildlife impact assessment (Hansen and Martin 1989). These largest North American woodpeckers are strong excavators, and forage primarily on ants and beetle larvae in logs, standing dead trees, and live trees. In northeastern Oregon they forage primarily in mature grand fir forests and maintain year-round territories. They excavate large cavity nests usually in dead ponderosa pine or larch trees greater than 22 in diameter at an average height of 45 ft (Bull 1987). In northeastern Oregon, pileated woodpeckers start nest excavation in April. Incubation occurs in early to mid-May and fledging occurs from late June to mid-July (Bull 1980).

Methods

Pileated woodpecker abundance was measured during surveys of upland forest areas conducted from 19 April - 17 May 1993 and 25 March - 9 May 1994. These periods were selected to coincide with the pileated woodpecker breeding season in order to maximize detectability.

Fourteen transects (1993 - 7, 1994 - 7) were located in upland forest by dividing the upper plateau into 5 areas of similar size bounded by drainages, roads, or topography. Two to 4 transects were located in each area. On half the transects, 8 - 10 survey points were established at 250 m intervals starting at a random point and following a random compass bearing. The other transects followed open or closed roads with 8 - 10 survey points located at 0.5 mi (open roads) or 250 m (closed roads) intervals with most points located at least 100 m off the road (Bate 1993) (Fig. 2). An effort was made to locate points on mitigation lands, but due to mixed ownership patterns, some survey points were located on BLM and IDL property.

'Each point was surveyed 4 times (4 count periods) in 1993, and 2 - 4 times in 1994.

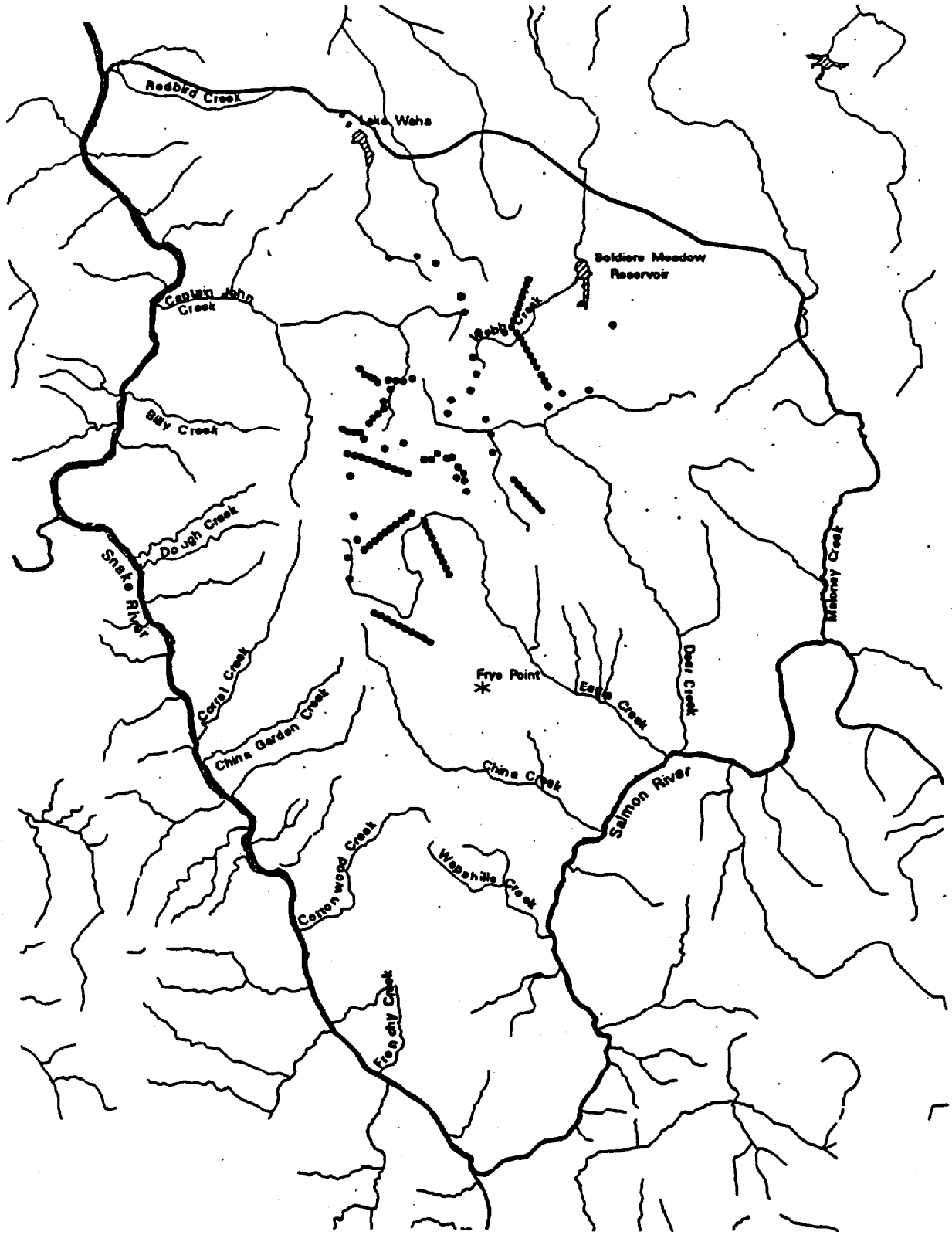

Figure 2. Location of woodpecker survey points at Craig Mountain, 1993 and 1994.

Three observers conducted the surveys each year for a total of 5 observers. Most points were surveyed by at least 2 different observers. Surveys were conducted from 0600 - 1000, the starting location was usually alternated each time the transect was run. Surveys were conducted at each point for a 5 minutes using a variable circular plot technique (Reynolds et al. 1980). All birds seen or heard were recorded, and the distance at which they were observed was estimated. Densities were calculated using the ordered distance method (Patil et al. 1982; Roeder et al. 1987; Variable Circular Plot software version 1.5, Garton and Leban 1993). This method estimates density using a nonparametric probability density function that calculates a detection curve from the distances at which birds are observed. This takes into account the differential survey areas or coefficients of detectability (Emlen 197 1), for conspicuous birds such as pileated woodpeckers and less observable birds such as yellow warblers as well as correcting for differences in observability by vegetation type. The computation involves ordering the detection distances from smallest to largest $(r_1, \ldots r_n)$.

$A_k = \Pi r_k^2 =$ the k^{th} ordered area
n^q = the greatest integer $\leq n^q$, where n is the number of detections
$q = 4/5$ if the detection curve has a shoulder
$q = 2/3$ if the detection curve is J-shaped

The estimate of the 0 intercept of the probability density function = $\hat{f}(0) = \frac{n^q - 1}{A(n^q)}$

The assumptions for using the variable circular plot technique are: (1) birds are distributed randomly and independently over the census region; (2) birds directly on, or very near to, the center of each plot will always be detected; (3) there is no movement of birds in response to the observer, and none are counted more than once in a given census; (4) all detection distances are measured without error; and (5) sightings of different birds are statistically independent events (Roeder et al. 1987).

Training at distance estimation and bird identification was conducted for all observers. Point descriptions included distances and bearings to various landmarks for comparison of distance estimates. Bird call tapes, field guides and field training were used to aid in species identification. Woodpeckers were identified to species when they were seen or when they called. Sapsuckers were identified by calls, drumming, and by sight.

Results

Pileated woodpeckers were recorded at 47 of 134 points (35%) on 13 of 14 breeding bird transects at Craig Mountain (Table 3). Highest densities were recorded in the upper Eagle Creek headwaters area, and along Webb Creek north and south of Kruze meadows. Lowest densities were in the Deer Creek/Swamp Creek area, China Saddle area and in upper Captain John Creek (Table 3).

Table 3. Distribution and abundance of pileated woodpeckers at Craig Mountain, 1993 and 1994.

Transect	Type[1]	Year run	No. points	Count periods	Location	Birds/Count period	Density (birds/ha)	90% bound
11	RB	93	10	40	Webb creek	0.17	0.083	0.066
12	RB	93	10	4 0	Webb Creek	0.20	0.019	0.014
15	OR/CR	93	10	40	540 Rd./Lake cr.	0.08	0.007	0.009
16	CR	93	8	32	Browns Cr./Captain John Cr.	0.16	0.012	0.012
21	RB	94	8	16	Swamp Creek	0	0	
27	O R	93	8	32	swamp Cr./Deer cr.	0.03	0	
31	CR	94	10	23	Captain John Creek	0.09	0	
32	CR	94	10	40	Captain John Creek	0.15	0.06	0,054
41	RB	94	10	30	Eagle Creek SW	0.20	0.028	0.028
42	CR	94	10	22	Eagle creek NE	0.14	0.013	0.018
51	RB	93	10	40	Eagle creek SW	0.20	0.025	0.022
52	RB	93	10	40	Eagle Creek SW	0.17	0.037	0.027
53	RB	94	10	20	China Saddle	0.10	0.003	0.004
55	OR	94	10	20	540 Rd. Eagle Cr.- Roberts Spring	0.20	0.03 1	0.036
Total			134	435				
Average *(se)*						0.135 (0.018)	0.023 *(0.007)*	

[1] RB = random bearing, OR = open road, CR = closed road.

Discussion

Pileated woodpecker densities averaged 0.023 ± 0.012 (90% CI) birds/ha (Table 3). If the upland forest habitats at Craig Mountain cover 10,927 ha (27,000 acres) then a population estimate would be: 10,927 x 0.023 = 250 ± 126. The high variability in the density estimation (the population would probably have to double or decline by over 50% in order to detect it in surveys) is at least partly due to habitat differences within and among transects. This variability could be reduced by using vegetation information (Narolski, unpubl. data; Mancuso and Cassirer, unpubl. data) to stratify transects or points by vegetation type, abundance of large trees, % canopy cover, snag densities, and/or abundance of woody debris. Stratification would also help with accuracy of the population estimate and would better satisfy the assumptions of the variable circular plot technique. A single detection curve calculated for all observations by vegetation type might also help increase precision of density estimates.

Pileated woodpecker densities were lowest in thinned areas and ponderosa pine plantations in Swamp Creek, and areas managed by IDL in Upper Captain John Creek, and at China Saddle. Analysis of vegetation data will allow calculation of baseline habitat units (HU's) and comparison of pileated woodpecker abundance with these habitat unit values will provide an opportunity to test the HEP pileated woodpecker HSI model for the Craig Mountain area. The HSI models are working quantitative summaries of available information and have not been validated. Validation should involve evaluation of the model assumptions, as well as determining accuracy of field predictions (VanHorne and Wiens 1991).

Although pileated woodpeckers are often associated with mature or old growth coniferous forest in the northern Rocky Mountains (Hejl and Wood 1991, Hejl 1992), the abundance of pileated woodpeckers on Craig Mountain may be related to the presence of dead, diseased, and dying standing and down trees as well as to the presence of mature forest habitats. Past logging operations removed only the most merchantable trees, and left the rest on the ground or standing. This "high-grading" has reduced the amount of mature forest at Craig Mountain, but has maintained at least temporarily, habitat for pileated woodpeckers and other cavity nesters.

Conclusions

Pileated woodpeckers are widespread throughout the upland forest at Craig Mountain, at varying densities. Both dead and green trees are important in providing nesting, roosting, and foraging habitat for pileated and other woodpeckers (Rate 1995) and woodpecker numbers at Craig Mountain are likely related to the abundance of these habitat components. Management of upland forest habitats, particularly distribution and abundance of snags, mature trees, replacement snags, and woody debris will be important in affecting pileated woodpecker population densities. Snag management guidelines would be useful for planning forest management activities in pileated woodpecker habitat.

YELLOW WARBLER

Yellow warblers are neotropical migrants and are considered riparian generalists (Ehrlich et al. 1988). Yellow warblers winter in central America and arrive on Idaho breeding areas in late April or May. They nest throughout Idaho, constructing a cup nest in trees or shrubs. Widespread declines have been documented in many neotropical migrant landbirds, including yellow warblers, within the last few decades, probably due to habitat loss and degradation on either breeding and/or wintering areas (Saab and Groves 1992).

Methods

Breeding bird point count surveys for yellow warblers and other birds were established in riparian areas along China, Eagle, and Wapshilla Creeks. Survey points were located at least 250 m apart along an elevational gradient from 1,000 - 5,000 ft elevation (Fig. 3). Most points were surveyed at least 3 times (3 count periods) using variable circular plot methodology (see pileated woodpecker surveys) from mid-May to early July to coincide with the yellow warbler breeding period. Surveys were conducted between 0500 and 0930 by 3 observers in 1993 and 2 observers in 1994 for a total of 4 observers. Results were not stratified by observer. Eagle Creek surveys were conducted in 1993, China and Wapshilla Creek surveys were conducted in 1994. In 1993, counts were conducted for 5 minutes at each point. To better survey each point and to reduce differences among observers, a 10-minute count period was used in 1994. However, in order for data to be comparable between years, only data collected during the first 5 minutes is reported.

Results

Yellow warblers were recorded at 47 survey points in riparian areas and 9 points in shrubby draws in Eagle, China, and Wapshilla Creeks. Yellow warblers occurred at elevations below 3,500 ft in China Creek and elevations below 3,000 ft in Eagle Creek. Average number of birds observed per count period was highest below 2,500 ft elevation (Table 4, Fig. 4). Numbers of yellow warblers observed per count period were similar in the Eagle and China Creek drainages. In comparison, fewer yellow warblers were observed at the lowest elevations in the Wapshilla Creek drainage, but more were observed from 2,001 - 2,500 ft (Table 4). Densities averaged 0.79 (SE 0.03) birds/ha and were also highest below 2,500 ft, although few significant differences in densities could be detected (Fig. 5).

Discussion

Yellow warblers were observed in lower elevation riparian habitats, predominantly in association with white alder vegetation typos. White alder communities occur primarily in riparian stringers below 2,500 ft 'elevation (Mancuso and Moseley 1994) as did yellow

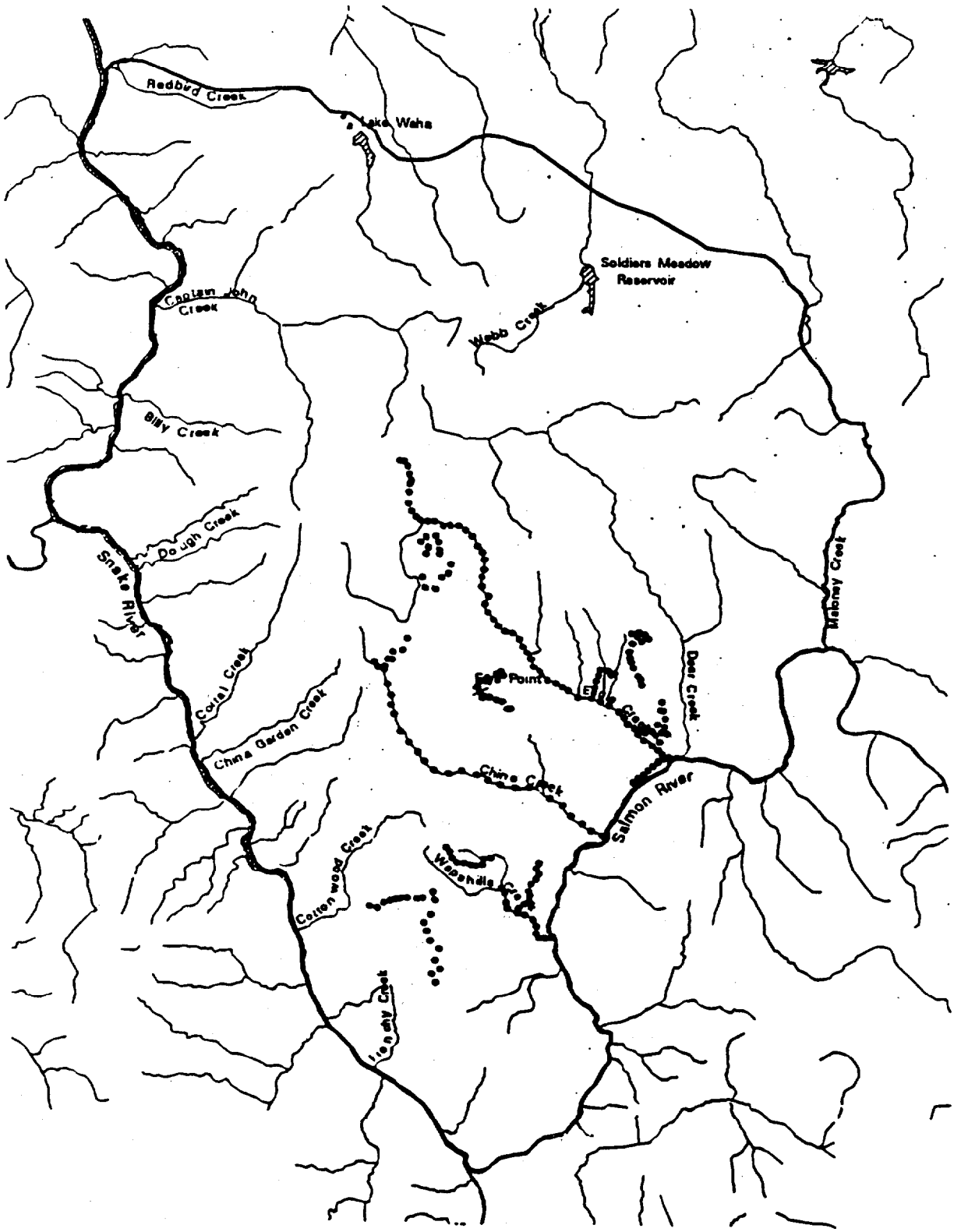

Figure 3. Location of songbird survey points at Craig Mountain, 1993 and 1994.

Table 4. **Average number of yellow warblers observed per count period (n) in 3 drainages at Craig Mountain, 1993 and 1994.**

Elevation (f)	Eagle Creek $\bar{X}$ (*SE*) n	china creek $\bar{X}$ (SE) n	Wapshilla Creek $\bar{X}$ (*SE*) n	Combined $\bar{X}$ (SE) n
1,001 - 1,500	**0.76 (0.02) 21**	**0.57 (0.08) 14**	0.11 (0.01) **18**	**0.43 (0.006) 54**
1,501 - 2,000	**0.76 (0.02) 28**	**0.60 (0.07) 16**	**0.67 (0.04) 12**	**0.60 (*0.08*) 50**
2,001 - 2,500	**0.24 (0.01) 21**	**0.17 (0.01) 12**	1.17 (0.13) 6	**0.37 (0.02) 39**
2,501 - 3,000	0.1 ***(0.01)*** **21**	0.11 (0.00) 6	**ns**[1]	0.10 (*0.003*) 30
3,001 - 3,500	**0, 21**	0.19 ***(0.01)*** **16**	**ns**	**0.08 (*0.002*) 37**
3,501 - 4,000	**0, 21**	**0, 10**	ns	**0, 31**
4,001 - 4,500	**0, 21**	**0, 24**	**ns**	**0, 45**
4.501 - 5.000	**0, 21**	**0, 18**	**ns**	**0, 39**

[1] **ns = not surveyed.**

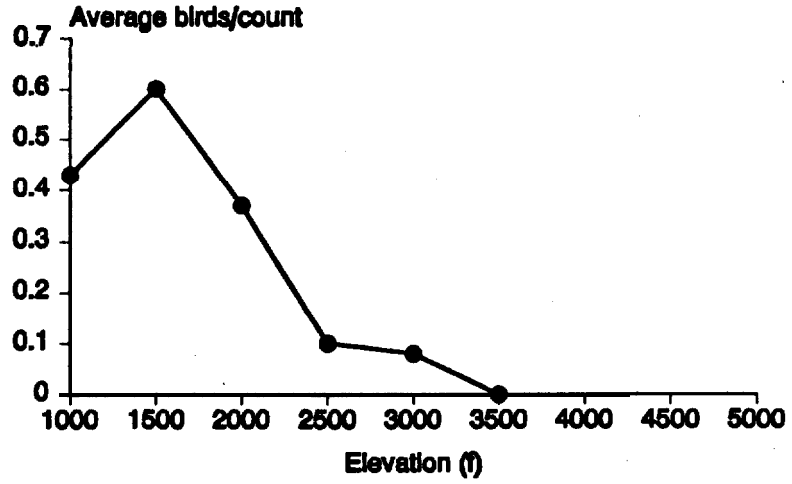

Figure 4. *Average* **number of yellow warblers observed per count period in Eagle, China, and Wapshilla Creek riparian areas at Craig Mountain, Idaho, 1993 and 1994.**

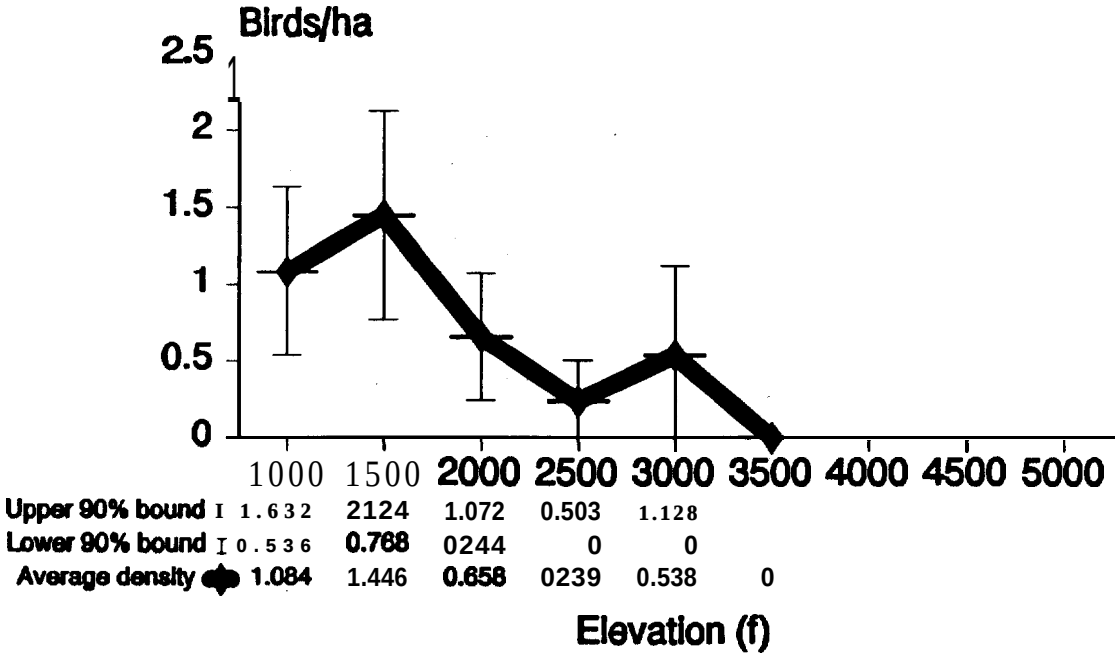

Figure 5. *Average* **estimated densities of yellow warblers in Eagle, China, and Wapshilla Creek riparian areas, Craig Mountain, Idaho, 1993 and 1994.**

warblers. Vegetative structure, including shrub height and canopy cover, are important factors in determining the abundance of yellow warblers. Livestock grazing in riparian areas and shrubby draws has likely been impacting yellow warblers and other shrub-nesting birds by reducing or eliminating the shrub understory and by increasing numbers of brown-headed cowbirds which are parasitic on these species (see wildlife community relationships, p. 85). Significant increases in yellow warbler numbers have been documented following exclusion of cattle from riparian habitats (Krueper 1993). Yellow warbler populations are also affected by factors off Craig Mountain, in particular habitat conditions in tropical wintering areas (Saab and Groves 1992).

Vegetation information collected at survey points will assist in interpreting species abundance information, will allow calculation of baseline HU estimates and will provide an opportunity for testing the HEP HSI model. Monitoring should be conducted using a 10-minute survey period, with data collected in the first 5 minutes recorded separately to allow comparison to 1993 data.

BLACK-CAPPED CHICKADEE

Black-capped chickadees are yearround residents of deciduous and mixed deciduous-coniferous forests, riparian areas and shrublands. They feed primarily on insects, pine seeds, and berries. Cavities excavated for nesting are usually in broken-top deciduous trees in advanced stages of decay (Runde and Capen 1987). Winter roosting occurs in dense conifer stands or old nest cavities.

Methods

Black-capped chickadees were surveyed along transects in upland forest, riparian, and shrub vegetation from March - July using variable circular plot methodology (see pileated woodpecker and yellow warbler methods).

Results

Black-capped chickadees were recorded at 30 breeding bird survey points in riparian and mixed shrub vegetation at all elevations (Table 5, Fig. 6). Average density was 0.34

Table 5. *Average* **number black-capped chickadees observed per count period (n) in 3 drainages at Craig Mountain, 1993 and 1994.**

Elevation (f)	Eagle Creek $\bar{X}$ (SE) n	China Creek $\bar{X}$ (*SE*) n	Wapshilla Creek $\bar{X}$ (*SE*) n	Combined $\bar{X}$ (*SE*) n
1,001 - 1,500	0.10 (0.04) 21	0.47 (0.06) 14	0.39 (0.09) 18	0.28 (0.01) 54
1,501 - 2,000	0.04 (0.07) 28	0.20 (0.05) 10	0.17 (0.04) 12	0.10 (0.002) 50
2,001 - 2,500	0.1 (0.02) 21	0.17 (0.08) 12	0, 6	0.11 (0.003) 39
2,501 - 3,000	0.05 (0.02) 21	0, 6	ns[1]	0.03 (0.03) 30
3,001 - 3,500	0.14 (0.05) 21	0.31 (0.12) 16	ns	0.22 (0.02) 37
3,501 - 4,000	0.24 (0.06) 21	0, 10	ns	0.16 (0.03) 31
4,001 - 4,500	0, 21	0.08 (0.03) 24	ns	0.04 (0.008) 45
4,501-5,000	0.07 (0.04) 21	0.22 (0.06) 18	ns	0.16 (0.002) 39
Average	0.09 (0.03) 8	0.18 (0.05) 8	0.19 (0.11) 3	0.14 (0.08) 8

[1] ns = not surveyed

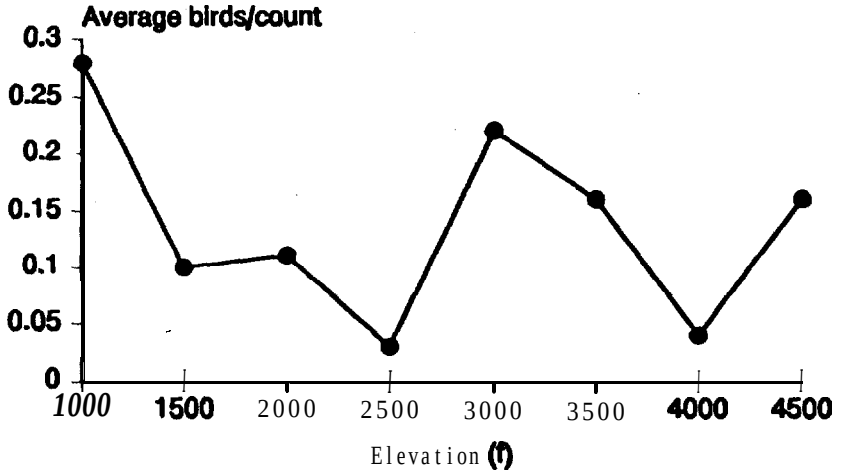

Figure 6, Average **number black-capped chickadees observed per count period in Eagle, China, and Wapsbii Creek riparian aud mixed tall shrub vegetation, 1993 and 1994.**

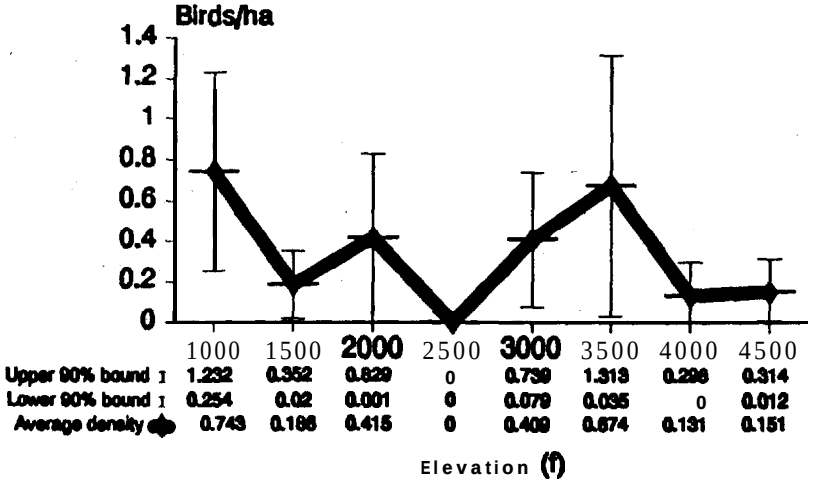

Figure 7. Average **estimated densities of black-capped chickadees iu Eagle, China, and Wapshii Creek ripariau and mixed tall shrub vegetation, 1993 and 1994.**

(SE 0.08) birds/ha. Black-capped chickadees were also observed in upland forest, although mountain chickadees arc the predominant chickadee species in forested areas at Craig Mountain. Average number of black-capped chickadees recorded per count period in riparian areas was twice as high in China Creek as in Eagle Creek, although this was not significant ($p > 0.05$, Table 5). Black-capped chickadees occurred at relatively low densities above 4,000 ft elevation, but there were no significant differences in density among elevations (Pig. 7).

Discussion

Black-capped chickadees were widespread at Craig Mountain and occurred in riparian areas and shrubby draws at all elevations as well as in upland forest. Black-capped chickadees usually select dead trees less than 10" dbh in advanced stages of decay for nesting (Runde and Capen 1987). The HEP HSI model incorporates tree canopy and snag densities as important factors in affecting densities. Vegetation information collected at survey points will assist in interpreting abundance information, 'in providing baseline HU values, and in testing the HSI model.

RIVER OTTER

River otters were considered an indicator of riverine and riparian habitats in the Craig Mountain Mitigation Project. They also have cultural significance for the Nez Perce tribe and are a BLM sensitive species. Otters are susceptible to overharvest, and have been extirpated from parts of their historical range by trapping and through habitat destruction. River otters occur in association with a variety of aquatic habitats in Idaho including lakes, streams, and wetlands and are most abundant in areas with intact riparian habitats and a plentiful food supply (primarily slow moving fish or crayfish). Male river otter annual home ranges on the Clear-water River average 64 miles in length; female home ranges average 15 miles in length (Mack et al. 1994). Females give birth in March or April in burrows excavated by other animals such as beavers, or in natural shelters. The family group remains in the natal area for at least 3 months and may stay together until just prior to the birth of a new litter (Melquist and Hornocker 1983).

Prior to this study, river otters were known from riverine habitats along the Snake and Salmon Rivers at Craig Mountain. As part of the Dworshak mitigation project, a river otter study was also conducted by the Nez Perce Tribe along the Clear-water River (Mack et al. 1994).

Methods

Determining abundance of river otters would require an intensive study including trapping and marking, which was not feasible within the scope of this project. Instead, a

habitat/sign survey was conducted to assess suitability and river otter distribution, and incidental sightings of river otter were collected throughout the study period. The river otter survey covered the lower Salmon and Snake River corridors and was conducted 13 - 14 October 1993. This period was selected as a time when family groups are mobile and otters or sign are most likely to be observed. The lower Salmon River was surveyed by raft, and the Snake River was surveyed by jetboat. Most sandy and some rocky beach areas were surveyed for river otters and river otter sign, including tracks and scats.

Results

A heavy rain occurred prior to the start of the otter survey along the Salmon and Snake Rivers, and intermittent rain continued during the survey. No otters were observed, however despite the rain, otter sign (mostly scats) was seen at 30 locations (Table 6, Fig. 8). Otter sign was often observed on benched, sandy beaches as opposed to flat or gradually sloping areas. Otter scats contained (in order of abundance) crayfish (*Astacus spp.*), suckers (*Catostomidae*), bass (*Centrarchidae*), and unidentified salmonids (trout etc.) (*Salmonidae*). Several suitable den sites were observed. Incidental observations of river otters were collected throughout the study period (Table 7, Fig. 8).

Table 6. River otter sign and habitat observed during a survey of the Salmon and Snake Rivers at Craig Mountain, 13-14 October 1993.

River	Location'	Observation	UTME	UTMN
Salmon	between China Beach and islands (RR)	tracks	520600	5090550
Salmon	mouth of Flynn Creek	scat	520600	5083400
Salmon	Under powerline (RL)	high use haul out, lots of scat	520500	5081100
Salmon	Blue Canyon (RL)	scats, rolling site	518000	5078500
Salmon	Below eye of the needle (RL)	tracks	516700	5077850
Salmon	Just above confluence (RR)	scats	516600	5077800
Snake	above First Creek (RR)	scats, repeated use haul out site, good denning habitat in boulders	515500	5078700
Snake	above Hells Canyon sign at small ponderosa pine, (RR)	scats	513940	5080860
Snake	near draw (RR)	scats	513420	5081225

Table 6, cont'd. River otter sign and habitat observed during a survey of the Salmon and Snake Rivers at Craig Mountain, October 13-14, 1993.

River	Location[1]	Observation	UTME	UTMN
Snake	above Cook Cr. (RR)	scats	511350	5083 175
Snake	above Cook Cr., under rock outcrop facing upstream (RR)	resting area, scats	511150	5083360
Snake	across from upper Cottonwood Cr. beach (RL)	many scats	510030	5086580
Snake	below Cottonwood Creek (RL)	scats	509660	5088175
Snake	just above Big Cougar Creek, RM180 (RR)	scats	509200	5089380
Snake	Cougar rapids bar (RR)	Scats	508440	5089850
Snake	across from upper Cochran Island (RR)	scats	508340	5090150
Snake	mouth of intermittent creek (RR)	scats	508440	5090880
Snake	across from Garden Creek (RR)	scats	508475	509 1050
Snake	above Cache Creek (RL)	rolling spot, scats	507650	5091875
Snake	mouth of Bear Creek (RL)	scats	506300	5094920
Snake	above Corral Creek (RR)	scats, tracks	506450	5094100
Snake	above Shovel Creek (RL)	resting site, scats	506080	5095550
Snake	above Birch Creek (RL)	scats	505380	5097380
Snake	between Chimney and Middle Creeks (RR)	tracks, scat	504590	5100300
Snake	between Chimney and Middle Creeks (RL)	tracks, scat, denning habitat	504410	5100400
Snake	across from Dough Creek (RL)	tracks	504050	5101150
Snake	S. of Limestone Point (RR)	tracks, scat	503730	5101850
Snake	below Captain Lewis Rapid (RR)	scats	503175	5104750
Snake	above Camp Creek (RR)	tracks, rolling site, scat	503425	504950
Snake	below Camp Creek (RR)	scat	503840	5 105875

[1] RR = river fight, RL = river left

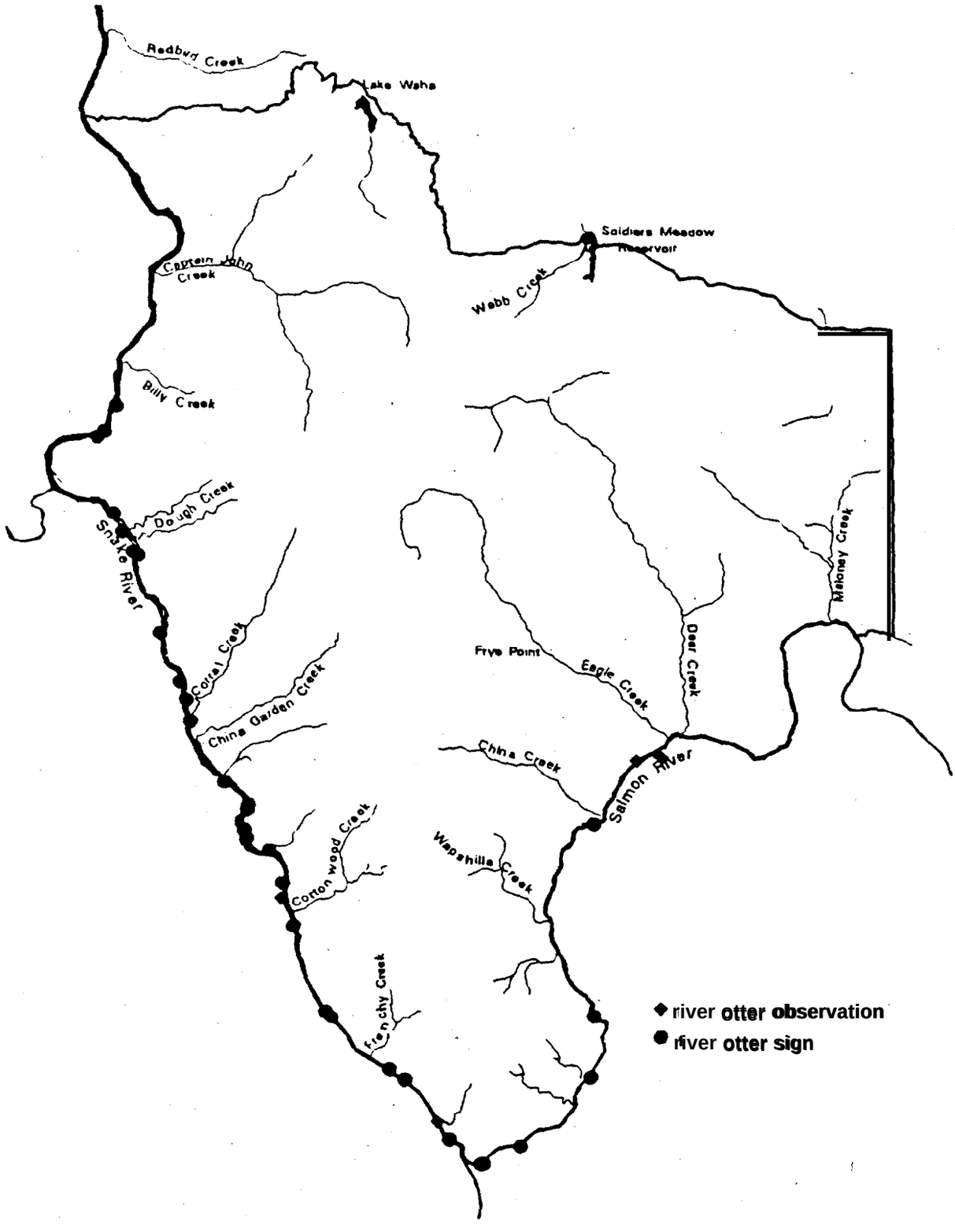

Figure 8. **Observations of river otters at Craig Mountain 1993 and 1994, and observations of river otter sign during a survey of the Salmon and Snake Rivers, October 1993.**

Table 7. Incidental river otter observations at Craig Mountain, 1993 and 1994.

Date	Observation	Location	UTME	UTMN
3/17/93	1 otter	Salmon River below Eagle Creek	523000	5093000
12/21/93	1 adult w/3 young	Snake River near Frenchy Creek	515060	5079350
7/17/94	1 otter	Salmon River below Eagle Creek	522120	5092880
7/19/94	4 otters	Snake River below Cottonwood Cr.	509600	5087600

Discussion

The river otter habitat suitability model developed for the Dworshalc impact assessment assumes that the 4 most important river otter habitat components are (1) annual water fluctuations, (2) shoreline cover, (3) den site availability, and (4) levels of human disturbance. The Snake River has higher and more frequent water fluctuations caused by regulated flow throughout the year, although both rivers have high annual variability in water levels. Both the lower Salmon and Snake Rivers at Craig Mountain would likely have similar values for shoreline cover. Suitable denning habitat was available on both the Snake and Salmon Rivers. Bank substrates are important in providing denning structures, and were suggested as a possible limitation on the number of otter den sites in the Clearwater River Drainage. Den sites on the Clearwater were most commonly in areas with fragmented boulder-size rocks with large interstitial spaces (Mack et al. 1994). Levels of human disturbance are likely higher on the Snake River than the Salmon River, because it is more accessible to jet boats. However, this may not be a critical factor because otters seem to be able to coexist with fairly high levels of human activity by becoming nocturnal (C. Mack, pers. commun.).

Suitable river otter feeding and denning habitat is available and widely used on both the lower Salmon and Snake Rivers at Craig Mountain. Salmon and Snake River tributaries on Craig Mountain could potentially provide natal den sites, but are probably used only rarely as travel corridors because of their small size and narrow riparian areas. River otter populations at Craig Mountain are likely controlled by habitats and management off mitigation lands. Conservation of potential den sites, conservation or enhancement of riparian vegetation, and maintaining fish (especially slow-moving fish such as suckers) and crayfish populations would be beneficial to river otter at Craig Mountain.

DISTRIBUTION AND ABUNDANCE OF RARE ANIMALS

Rare animals were classified as those species that have special status with state and/or federal resource management agencies because of low numbers, limited distribution, population declines, or and/or habitat loss. These species deserve particular management consideration in order to maintain and/or enhance populations and avoid declines on a local or regional level. This section summarizes the results of special status species surveys, gives a brief description of special status animals found on Craig Mountain, and includes the locations, number, and significance of observations.

Methods

Most information on special status animals was collected during community-level surveys for birds, mammals, reptiles, and amphibians. However, surveys were‘ conducted specifically for several birds, including aerial surveys for wintering bald eagles, and tape playback and calling surveys for mountain quail, great gray owls, flammulated owls, **white-**headed woodpeckers, and pygmy nuthatches. A short training session on species identification was also given to all personnel working at Craig Mountain in May 1993, and a species list and sighting form were distributed for reporting incidental sightings.

Results

Fifteen animal species with special classification were documented at Craig Mountain. This included 1 USFWS threatened species and 6 category 2 candidate species. Twelve species were classified as state species of special concern, 4 as USFS, Region 1 sensitive species, and 10 as BLM sensitive species (Table 8). Idaho state species of special concern are defined as “native species which are either low in numbers, limited in distribution or. have suffered significant habitat losses” (Idaho Conservation Data Center 1994). Nine of the 11 state species of special concern observed at Craig Mountain are classified as category C - undetermined status: “species that may be rare in the state but for which there is little information on their population status, distribution, and/or habitat requirements”. One species: white-headed woodpecker is classified as category B - peripheral species: “species which meet one or more of the criteria (for species of special concern) but whose populations in Idaho are on the edge of a breeding range that **falls** largely outside the state”. The other species of special concern, mountain quail, is classified as category A - priority species: “species which meet one or more of the criteria (for species of special concern) and for which Idaho presently contains or formerly constituted a significant portion of their range” (Idaho Conservation Data Center 1994).

Another 5 species with special designation are potentially present, based on availability of suitable habitat and the species **occurence** in surrounding areas, although they were not observed in this study (Table 9). No evidence was found to support the presence

Table 8. Special status animals located at Craig Mountain, 1993 and 1994.

Species	USFWS[1]	State	USFS R-1	BLM Status	Minimum no. observed	Habitat[2]
Bald eagle *Haliaeetus leucocephalus*	T	T		Winter	6	A, R
Tailed frog *Ascaphus truei*	C2			Resident	>60 adults	A,R
Spotted frog *Rana pretiosa*	C2		S	Resident	>200 adult8	A, WM R, UF
Northern goshawk *Accipter gentilis*	C2	s s c	I	S breeding	2 - 6	UF, R
Mountain quail *Oreortyx pictus*	C2	s s c	S	S Resident	2	R, CF, SD
Townsend's big-eared bat *Plecotus townsendii*	C2	SSC	S	S Resident	>30	B, CF UF, R
Fringed myotis *Myotis thysanodes*	C2	s s c		Resident	>20	B, R, CF
Western toad *Bufo boreas*		s s c		S Resident	>100	A,R,WM G, UF
Ringneck snake *Diadaphis punctatus*		s s c		S Resident	1	G, SD, CF, B
Great gray owl *Strix nebulosa*		SSC		S Resident	4	UF, WM
Flammulated owl *Otus flammeolus*		SSC	S	S breeding	6	UF, CF
Northern pygmy-owl *Glaucidium gnoma*		SSC		Resident	2	UF, CF
White-headed woodpecker *Picoides albolarvatus*		SSC	S	S Resident	3	UF, CF
Pygmy nuthatch *Sitta pygmae*		SSC		S Resident	3	UF, CF
Western Pipistrelle *Pipistrellus hesperus*		s s c		Resident	2	B, R

1 T = threatened, C2 = Category 2 candidate, SSC = Species of Special Concern, S = Sensitive Species (Idaho Conservation Data Center 1994). I = indicator species.

2 A = Aquatic, WM = Wet meadow, R = Riparian, UF = Upland forest, G = Grasslands, B = Rocky breaks and cliffs, CF = Canyon forest, SD = Shrubby draw.

Table 9. Special status animals potentially occurring at Craig Mountain, but not observed 1993 and 1994.

Species	USFWS'	State	USFS R-1	BLM	Habitat?
Peregrine falcon *Falco peregrinus*	E	E			B, R, G
Pygmy shrew *Microsorex hoyi*		ssc			UF
California myotis *Myotis californicus*		ssc			B, R, WM
Spotted bat *Euderma maculatum*	c2	ssc		S	B, CF
Northern flying squirrel *Glaucomys sabrinus*		ssc			UF

1 E = endangered, C2 = Category 2 candidate, SSC 5 Species of Special Concern, S = Sensitive Species (Idaho Conservation Data Center 1594).

2 B = Rocky breaks and cliffs, CF = Canyon forests, G = Grasslands, R = Riparian, UF = Upland forest, WM = Wet meadow.

of 8 additional rare species that potentially could have occurred at Craig Mountain: ferruginous hawk, sharp-tailed grouse, yellow-billed cuckoo, black-backed woodpecker, loggerhead shrike, Preble's shrew, coast mole, and lynx (Appendix A). American white pelicans, (state species of special concern), were observed during migration along the Snake River. An immature harlequin duck, (USFWS C2 candidate), was observed during fall migration on the Salmon River.

SPECIES DESCRIPTIONS

BALD EAGLE

Bald eagles are a USWFWS endangered species (currently proposed to be down-listed to threatened) and yearround resident in Idaho. They typically prefer to nest in remote, late-successional forests and shoreline areas adjacent to open water (Montana Bald Eagle Working Group 1991). One historical bald eagle nest was reportedly located at Craig Mountain, north of the mitigation area at the mouth of Captain John Creek on the Snake River in the 1950's. No recent bald eagle nests have been documented in the Craig Mountain area.

In winter, bald eagles migrate to northern and north-central Idaho primarily from Canada. Open water with concentrations of fish or waterfowl, carrion on big game winter ranges, or small mammals such as jackrabbits in areas with adequate perch and roosting sites will attract wintering bald eagles (Montana Bald Eagle Working Group 1991). During winter, bald eagles usually perch in large trees or snags close to foraging areas. At night, they typically congregate at communal night roosts in the tallest, most dominant trees in a forest stand. Night roosts are not necessarily adjacent to water or feediig sites, are protected from wind and human activity, and offer a clear view and an open flight path (Keister and Anthony 1983, Isaacs and Anothony 1987).

Methods

Wintering bald eagle surveys were conducted by helicopter along the Snake and Salmon Rivers during elk and deer aerial surveys in January 1993 and December 1993. Surveys were coordinated through the the Zone 3 bald eagle coordinator (Craig Johnson, BLM Cottonwood). Raptor surveys were also conducted along the Salmon and Snake River corridors in early April of both years (Appendix B).

Results

Four to 6 bald eagles were observed during mid-winter aerial surveys of the Craig Mountain Area (Table 10). Nearly all bald eagles observed were perched in mature ponderosa pine trees along the river. Bald eagles were observed at Craig Mountain from December through March. A single bald eagle was observed 4/4/93 at Pine Bar, on the lower Salmon upstream from Craig Mountain but most bald eagles had left the area by the

Table 10. Winter bald eagle aerial surveys conducted at Craig Mountain, 1993 - 1994.

Survey area	Date	Bald eagle observations
Limestone Point, Snake River to Maloney Cr., Salmon River	1/6/93	5 adults, 1 immature
Limestone Point, Snake River to Maloney Cr., Salmon River	1/7/93	4 adults
Limestone Point, Snake River to Maloney Cr., Salmon River	12/31/93	4 adults

Table 11. Selected incidental reports of bald eagles at Craig Mountain, 1993 - 1994.

Location	Date	UTME	UTMN	Observation
Lower China Creek	2/22/93	520000	5091300	1 adult, 1 immature
Mouth of China Creek	3/19/93	520980	5090830	1 adult
Waha Lake	3/23/93	5 12750	5117300	1 adult
Mouth of Wapshilla Cr.	3/24/93	519180	5086920	1 adult
Eagle Creek	1/11/94	520250	5096120	1 adult

end of March Incidental observations suggest that bald eagles also occasionally use riparian areas and lakes on Craig Mountain in early spring (Table 11).

Conclusions

Wintering habitat along the Snake and Salmon Rivers at Craig Mountain is used by small numbers of bald eagles. Six or fewer bald eagles were observed along the Salmon and Snake givers during the winters of 1993 and 1994. This is consistent with previous incidental observations and surveys (C. Johnson, pers comm). Bald eagles may occasionally use upland areas during migration. No surveys were conducted for night roosts although night roosts may occur in this area. If night roosts occur at Craig Mountain, they are probably located in the lower ends of Salmon and Snake River tributaries, in conifer stands closest to the rivers (Isaacs et al. 1992).

If bald eagle aerial surveys are conducted in conjunction with elk and deer sightability flights in the future they should continue to be coordinated through the Zone 3 bald eagle coordinator. In order to be added to the Idaho winter bald eagle count they would have to be conducted simultaneously with other bald eagle wintering counts in mid-January.

Bald eagle winter use at Craig Mountain may be primarily affected by weather and breeding and migration conditions. Factors on Craig Mountain potentially affecting bald eagle winter' use include: food supply, availability of perching or roosting sites adjacent to the Snake and Salmon rivers and along tributaries, and human disturbance (Knight 1984).

SPOTTED FROG

Spotted frogs arc usually found at the edges of ponds, lakes, or stream backwaters, often in areas with emergent vegetation. The species apparently feeds opportunistically on a

wide range of insects, as well as mollusks, crustaceans and arachnids. The embryos have a fairly wide thermal tolerance range from 7° to 28° C (Nussbaum et al. 1983).

Spotted frogs arc widely distributed throughout western North America. It is likely that there are actually several genetically distinct spotted frog species. Specimens collected at Craig Mountain in 1993 were included in a taxonomic study of the species across its range. Spotted frogs have disappeared, or are declining in several areas, including western Oregon and Washington (Nussbaum et al. 1983).

Methods

Pitfall arrays (see small mammal surveys, p. 64) were run from 20 September - 1 November 1993 and from 20 April - 12 May 1994. Visual surveys of potential pond and wetland breeding areas were conducted from April - August 1994 (Llewellyn and Peterson 1995). Incidental sightings were also collected throughout the survey period. Voucher specimens of most herpetofauna species were deposited at Idaho State University.

Results

Spotted frogs were captured at all pitfall trapping sites in wet meadows and in one alder riparian site in China Creek (AL1, Fig. 9), (Tables 12 and 13) although low capture

Table 12. Captures of herpetofauna (n/100 trap nights) in pitfall traps in 4 vegetation types at Craig Mountain, 1993.

		White alder (n=3) 960 TN	Douglas-fir (n=3) 972 TN	Idaho fescue (n=3) 908 TN	Wet meadow (n=3) 841 TN	All types (n=4) 3681 TN
Specie.5	n	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$	$\bar{X}$ (SD)	$\bar{X}$ (SD)
Long-toed salamander (*Ambysroma macroductylum*)	33	0	0.29 (0.59	0	3.58 (1.66)	0.97 (1.75)
Western toad (*Bufo boreas*)	3	0.10 (0.18)	0	0	0.24 (0.21)	0.09 (0.21)
Western skink (*Eumeces skiltonius*)	2	0	0.21 (0.37)	0	0	0.05 (0.11)
Spotted Frog (*Rana pretiosa*)	4	0	0	0	0.24 (0.21)	0.06 (0.12)
$\bar{X}$ captures/100 TN	4 2	0.03(0.05)	0.88 (1.42)	0	1.02 (1.71)	0.48 (0.54)
No. species		1	2	0	3	4

Table 13. Captures of herpetofauna (n/100 trap nights) in pitfall traps in 5 vegetation types at Craig Mountain, 1994.

Species	n	white alder (n=3) 735 TN $\bar{X}$ (SD)	Douglas-fir (n=3) 792 TN $\bar{X}$ (SD)	Idaho fescue (n=3) 805 TN $\bar{X}$ (SD)	Wet meadow (n=3) 682 TN $\bar{X}$ (SD)	Yellow starthistle (n=3) 756 TN $\bar{X}$ (SD)	All types (n=4) 3770 TN $\bar{X}$ (SD)
Long-toed salamander (*Ambystoma macrodactylum*)	30	0	0	0	4.53 (2.28)	0.13 (0.23)	0.93 (2.01)
Western toad (*Bufo boreas*)	3	0	0	0	0.51 (0.87)	0	0.10 (0.23)
Western skink (*Eumeces skiltonius*)	1	0	0	0	0	0.13 (0.23)	0.03 (0.06)
Spotted Frog (*Rana pretiosa*)	3	0.13 (0.22)	0	0	0.47 (0.51)	0	0.12 (0.20)
$\bar{X}$ captures/100 TN	37	0.03(0.07)	0	0	1.38 (2.11)	0.07 (0.08)	0.30 (0.61)
No. species		1	0	0	3	2	4

rates suggested that spotted frogs and other herpetofauna were not very effectively sampled through pitfall trapping at Craig Mountain. Visual surveys documented over 20 breeding areas in the upper elevation wet meadows, ponds, springs, and stream backwaters (Table 14). Spotted frogs were also observed in Eagle and Captain John Creeks (Llewellyn and Peterson 1995).

Conclusions

Spotted frogs appear to be restricted to wetland and riparian areas at Craig Mountain, and are most abundant at upper elevations. The species is a common breeder in ponds and wetlands on the upper plateau but is apparently absent at lower elevations. No spotted frogs were observed along the Snake and Salmon river corridors and biochemical analysis of the species in the Pacific northwest and Rocky Mountains suggests that the Snake River canyon may be a barrier to spotted frogs. Environmental information from a graduate study in progress at Craig Mountain (Llewellyn and Peterson 1995), along with vegetation information will provide additional habitat association data. Many of the areas used by spotted frogs have been influenced or created by human activities; including development of

Table 14. Selected spotted frog breeding sites located at Craig Mountain, 1993 - 1994.

Location	UTME	UTMN
Benton Meadows Ponds	5 1 4 6 7 9 5 14657	5 107668 5107641
Benton Meadows/W. Fork Deer Creek	514664 5 14708	5 107653 5107681
Larrabee Meadows/W. Fork Deer Creek	518291 518364 518412 5 1 8 3 9 8 518458	5106195 5 106224 5 106237 5106246 5 106268
W. Fork Deer Creek / 540 Road	5 16394	5 107457
Cattle pond/E. Fork Deer Creek	523799	5 102785
Deer Creek Road/575 Road Junction	524668	5110594
Robert's Spring	511981	5099623
Eagle Creek Headwaters	512012	5101012
Eagle Creek Headwaters Tributary	511827	5 100382
Frye Point Spring	5 15538	5097188
South Fork Captain John Pond	5 10347	5 102981
Brown's Creek tributary #1	515600	5110220
Brown's Creek tributary #2	515280	5110100

springs to create stock ponds and damming or alteration of streams by roads and culverts. Spotted frog tadpoles were also found in ruts on closed roads during the wet spring of 1993.

Although spotted frogs are abundant at Craig Mountain (and throughout northern Idaho) populations are declining in other parts of their range. Spotted frogs apparently cannot coexist with bullfrogs (*Rana catesbiana*), an introduced species (Nussbaum et al. 1983) and can be negatively impacted by fish, particularly (introduced) warm water fish (*Centrarchidae*) or trout. Introduced warm water fish, trout, and bullfrogs are present at Craig Mountain, although their distribution does not currently overlap with that of spotted frogs. These factors, combined with information suggesting recent global declines in amphibian populations (Wake 1991, Blaustein and Wake 1995), indicate the importance of

monitoring distribution and abundance of spotted frog populations at Craig Mountain.

TAILED FROG

Tailed frogs are found primarily in cold, swiftly-flowing, forested streams in the Pacific Northwest and northern Rocky Mountains. Females usually lay eggs every other year. It may take 2 - 4 years for tadpoles to metamorphose, and another 5 or 6 years for immature frogs to reach sexual maturity. Tailed frogs are sensitive to sedimentation and increases in water temperature.

Methods

Visual herpetofauna surveys were conducted in the upper reaches of Captain John, S. Fork Captain John, and West Fork Deer Creeks, and in sections of Eagle, Wapshilla and China Creeks in May and July 1994 (Llewellyn and Peterson 1995). Surveys were conducted by walking in or along the stream and looking in the water, under streambanks and under rocks in the stream. All permanent streams were also electroshocked by IDFG fisheries personnel in 1993 and 1994 (IDFG, unpubl. data).

Results

Tailed frog adults and tadpoles were found in upper (above 3000 ft) S. Fork of Captain John Creek (> 10 adults and > 100 tadpoles) and in upper (above 2200 ft) Eagle Creek (> 50 adults and > 100 tadpoles) (Llewellyn and Peterson 1995).

Discussion

Tailed frogs were restricted to a few locations in swiftly flowing streams surrounded by grand fir forest at Craig Mountain. Tailed frog populations can be reduced or eliminated by timber harvest (Nussbaum et al. 1983). Management of any timber harvest activities in or above tailed frog habitat should include designing harvest to avoid affecting water temperatures or increasing sedimentation, and monitoring impacts on tailed frog populations.

NORTHERN GOSHAWK

Northern goshawks are a forest-dwelling accipter inhabiting all major forest types. Goshawks generally nest in forested areas with 60% or greater canopy closure, construct a stick nest on snags, cliffs or large trees and may reuse the same nesting area intermittently for decades. Suitable foraging habitat is typically closed canopy forest with an open understory. Prey includes birds such as pigeons, jays, robins, woodpeckers and small

mammals, particularly chipmunks and squirrels.

Goshawks are thought to be declining in the southwestern United States because of logging, toxic chemicals, drought, fire, disease, or a combination of these factors (Crocker-Redford 1990, Northern Goshawk Scientific Committee 1991).

Methods

Goshawks were recorded during breeding bird surveys, during raptor surveys of the lower Salmon and Snake river corridors as well as recorded incidentally. No surveys were conducted specifically for goshawks.

Results

Six observations of goshawks were recorded (Table 15): 2 during raptor surveys, 2 during breeding bird surveys, and 2 incidental observations. Goshawks were observed along the Salmon River corridor during early April, and in the upland forest April - October.

Table 15. Northern goshawk incidental observations at Craig Mountain, 1993 and 1994.

Location	Date	UTME	UTMN	Observation
Upper Eagle Creek	4/28/93	513603	5 102443	1 male
Eagle Creek Reach, Salmon River	4/9/93	522000	5092800	1 adult
Eagle Creek Road	5/14/93	516150	5 107200	1 male
Lake Creek	10/15/93	512510	5114300	1 adult
Captain John Creek	4/29/94	513600	5 106900	2 adults
Zaza	7/20/94	512100	5100900	1 adult

Conclusions

Northern goshawks are occasionally observed in the upland forest on Craig Mountain during the breeding season, and likely nest in the area. Goshawks also use the river corridors during migration. Forest habitat conditions, including availability of nesting and foraging habitat may be a primary factor affecting goshawk populations at Craig Mountain.

MOUNTAIN QUAIL

Mountain quail historically inhabited shrub and riparian communities in California, Washington, Oregon, Idaho, and Nevada. The species range has declined dramatically throughout Oregon, Washington, and Idaho, probably primarily due to habitat loss. In Idaho they are now confined to remnant populations along the mid- to lower Snake River corridor, the lower Salmon River drainage, and the Little Salmon River drainage (Brennan 1989; Robertson 1989, 1990). Mountain quail in these areas are generally restricted to riparian stringers and shrubby uplands. They are usually migratory and winter in coveys below the snow line. In March, pairs start moving to nesting areas, often up in elevation to open forest. Mountain quail have been observed in Wapshilla, China, Eagle, Dough, and Captain John Creeks during fall within the last 10 years (Idaho Conservation Database, S. McNeill, IDFG, pers comm.). Mountain quail were reported in the South Fork of Captain John in October, 1992 (IDFG, unpubl. data). None were observed during the most recent surveys of Wapshilla, China, Deer, and Eagle Creeks (Robertson 1990).

Methods

Mountain quail wintering populations were surveyed December - March 1993 by walking snow-free riparian areas and shrubby draws. Mountain quail responses were solicited with an assembly call performed with an "Iverson" quail call or by whistling. One survey was also conducted with a dog in Birch Creek. Breeding habitat was surveyed in late May and early June 1994 by walking and/or driving along drainages and soliciting mountain quail responses with tape recorded assembly and male "yelp" calls (Heekin and Reese 1995). In 1994, habitat suitability was assessed based on structural characteristics of riparian and adjacent areas, and presence of mountain quail food species (Table 16).

Results

Most major drainages and a number of side drainages at Craig Mountain were surveyed in 1993 and 1994 (Table 16). Calling males were located in lower Eagle Creek on winter range, and in upper Eagle Creek on potential breeding range. An unconfirmed report was also received of mountain quail calling in a tributary to upper China Creek (Table 17).

Vegetation structure and plant species composition suggested that good winter habitat was available in Wapshilla, Eagle, Dough, and Chimney Creeks and Pruitt Draw. Suitable breeding habitat was found in Eagle, Dough, Chimney, and Corral Creeks and Pruitt Draw. Deer, Birch, and China Creeks also appeared to provide good wintering habitat. Neither Birch nor China Creek appeared to contain good breeding habitat. Breeding habitat in Deer Creek was not surveyed. Some drainages which did not appear to provide good breeding habitat, may actually contain suitable habitat in upper tributaries that were not surveyed.

Table 16. Mountain quail surveys conducted at Craig Mountain, Idaho, 1993 and 1994.

Area surveyed		Type of survey	starting point		Ending point		Habitat suitability		Mountain quail response
			UTME	UTMN	UTME	UTMN	Winter range	Breeding range	
Birch Creek	3/2/94	Dog	517300	5084700	*519320*	5085750	good	poor	*none*
corral creek	5/24/94	Playback	509880	5102950	506870	5094950	good/fair	good	*none*
Chimney Creek	5/31/94	Playback	508770	5 102860	506040	5102040	good	good	*none*
China Creek	2/18/93	Calling	520950	5090800	516120	5093220		-	*none*
upper China Creek	6/2/94	Playback	511500	5099100	513380	5097370	-	poor/fair	*none*
lower Cottonwood cr.	5/25/94	Playback	5 10030	5087040	510490	5087240	fair	-	*none*
Deer Creek	2/18/94	calling	524400	5093800	523700	5097300	good	-	*none*
Dough Creek	5/23/94	Playback	508500	5 103870	505820	5102020	good	good	*none*
Eagle Creek	12/21/93	Calling	520600	5095800	522620	5094300	good	-	*two males*
Eagle Creek	2/22/94	Calling	520600	5095800	522620	5094300	good	-	none
Eagle Creek	5/27/94	Playback	514190	5104770	522620	5094300	good	good	one male
lower First Creek	5/25/94	Playback	515210	5079340	515300	5079340	fair	-	none
Pruitt Draw	5/17/94	Playback	515660	5091020	5 17470	5089480	good	good	none
Pruitt Draw	5/26/94	Playback	515080	5090800	516650	5089900	good	good	none
Wapshilla Creek	2/22/94	Calling	5 18700	5087000	516400	5087300	good	poor	none
Wapshilla Creek	5/26/94	Playback	516790	5088800	514700	5089990	good	poor	none
Wapshilla Ridge	6/2/94	Playback	512300	5105530	511500	5099100	-	good	none

Table 17. Mountain quail observations at Craig Mountain, 1993 and 1994.

Drainage	Date	Elevation (f)	UTME	UTMN	Observation
Eagle Creek	12/21/93	1900	520600	5095800	2 males calling
China Cr. tributary'	4/7/93	3800	516400	5091400	3 malescalling
Eagle Creek	5/19/94	4000	5 15910	5102620	1 male calling
Eagle Creek	5/27/94	4000	515910	5102620	1 male calling

[1] Unconfirmed observation.

Conclusions

Mountain quail are present on Craig Mountain in low numbers and were documented in Eagle Creek and possibly in China Creek. Lack of observations in other drainages does not necessarily mean there are no mountain quail in these areas because calling surveys have low response rates (Heekin and Reese 1995). However, the few observations in this study, combined with anecdotal evidence, suggest numbers have declined despite the apparent availability of suitable wintering and breeding habitat. Craig Mountain could be considered as a potential release site for reintroduction/augmentation in the context of a state conservation strategy currently being developed for mountain quail.

TOWNSEND'S BIG-EARED BAT, FRINGED MYOTIS, WESTERN PIPISTRELLE

Three special status bat species were observed at Craig Mountain. Townsend's big-eared bat and fringed myotis are C2 candidate species. Western pipistrelle is a state species of special concern.

Townsend'a big-eared bats are widespread in western North America, but isolated populations in the midwest and southeastern U.S. are declining. The species feeds primarily on moths, often along forest edges, and most often occurs in association with mesic forests, although it uses a wide range of habitats including desert areas and prairies. In summer the females form maternity colonies in caves, mines, and buildings. Townsend's big-eared bats hibernate in mines, caves, or buildings at relatively cold temperatures (Kunz and Martin 1982). In Idaho, most known populations are in southern Idaho and few surveys have been conducted in north-central Idaho (Perkins 1992). Townsend's big-eared bats are yearround residents in Hells Canyon (Wallowa-Whitman NF, unpubl. data).

Fringed myotis occur in western North America and Central America from low elevation deserts and sage steppe to coniferous forests, but appear to be most common in open woodlands. Fringed myotis feed primarily on beetles. The species often has an elevational migration between winter and summer ranges. Maternity colonies and roosting

areas occur in mines, caves and buildings (O'Farrell and Studier 1980).

Western pipistrelles are small bats that frequent watercourses in arid areas of western North America and Central America and roost in caves, rock crevices and buildings.

Methods

Diurnal surveys of 12 mines and caves were conducted in July and December 1993, July 1994 and March 1995. Several abandoned buildings were surveyed during the day in July 1993 and 1994. Mist-netting was also conducted on 12nights in July 1993 and 1994. Upper elevation ponds were mist-netted 6 nights, low elevation riparian areas and the Snake and Salmon rivers were mist-netted 5 nights, unoccupied buildings 2 nights, and 2 mines along the Snake and Salmon Rivers were mist-netted 1 night each (Tables 18 and 19). Voucher specimens collected in 1994 were deposited at Idaho State University.

Results

Single Townsend's big-eared bats (probably males) were found to use 5 mines and caves as day roosts during the summer. Townsend's big-eared bats also used several mines along the Snake and Salmon Rivers as night roosts (Table 18). Multiple bat species roosted together in these mines at night. Lactating female Townsend's big-eared bats were captured at the Cottonwood Creek mine site, indicating the presence of a maternity colony within flying distance. Townsend's big-eared bats were also mist-netted at upper elevations in upland forest/dry meadow vegetation and appeared to be feeding on insects inside abandoned buildings at Zaza (Table 19).

Fringed myotis were found to use both abandoned mines mist-netted along the Snake and Salmon Rivers as night roosts, and were captured over a spring in open forest/grassland near Frye Point (Table 18 and 19). Two western pipistrelles were captured in mist nets along the Snake and Salmon Rivers, but were not captured in mist nets at mines (Table 19).

Conclusions

Townsend's big-eared bats were captured at 5 of 12 sites netted. This species appeared to occur in a relatively wide range of habitats at Craig Mountain. Fringed myotis occurred at upper and lower elevations at Craig Mountain, whereas western pipistrelles were only observed at lower elevations along the river corridor. No special status bat maternity colonies or hibemacula were located during this survey, but they are likely present. Considerable opportunity exists for additional study of distribution, numbers, trend, and life history of bats in the Craig Mountain area. Potential may exist for collaboration with the USFS and BLM.

Bat day use of mines surveyed during the summer seems to be limited to single individuals. However, all mines surveyed at night received extensive nocturnal use by Townsend's big-eared and/or other bats. No bats were observed in diurnal searches of

Table 18. Surveys of mines and caves for bats at Craig Mountain, 1993 - 1995.

Location	Length (m)	Date surveyed	Type of survey	Temp (°C)	Relative humidity (%)	Bat species observed	Number
Deer Creek Mine	~200	7/4/93	ds	12.5	"humid"	Plecotus townsendii	1 roosting
Deer Creek Mine		7/23/94	ds			none	
Deer Creek Mine		7/24/94	mn			Myotis evotis	
Duckworth Mine upper adit		12/30/93	ds			none	
Duckworth Mine upper adit		7/18/94	ds	20.5-2 1		none	
Duckworth Mine, middle adit		12/30/93	ds			none	
Duckworth Mine, middle adit		7/18/94	ds	18		none	
Duckworth Mine, lower adit	45.2	12/30/93	ds			none	
Duckworth Mine, lower adit		7/18/94	ds	18-26.5		Plecotus towusendii	1 roosting
Duckworth Mine, lower adit		3/20/95	ds	17	70	none	
Pullman Mine, upper adit		8/31/93	ds			none	
Pullman Mine, upper adit		7/19/94	ds	13.5-15.5		none	
Pullman Mine, upper adit		3/20/95	ds	14.5-16	63	none	
Pullman Mine, lower adit		8/31/93	ds			Myotis spp.	2 roosting
Pullman Mine, lower adit		7/18/94	mn			Plecotus townsendii Myotis thysanodes Myotis lucifugus	> 1 (all > 10 captured > 10 2130-2230)
Pullman Mine, lower adit		7/19/94	ds	16-24		none	
Pullman Mine, lower adit		3/20/95	ds	15.5-17.5	85	none	

Table 18, cont'd. Surveys of mines and caves for bats at Craig Mountain, 1993 - 1995.

Location	Length (m)	Date surveyed	Type of survey	Temp (°C)	Relative humidity (%)	Bat species observed	Number
"2nd Creek" Mine	1s	3/20/95	ds	16	54	none	
Cottonwood Creek Mine	18.5	7/19/94	ds			none	
Cottonwood Creek Mine		7/19/94	mn			Myotis thysanodes Myotis lucifugus Plecotus townsendii	> 10 > 10 > 10, including lactating female
Cottonwood Creek Mine		3/20/95	ds	14	80	none	
Cache Bar Mine	31.7	7/20/94	ds	19.5-28		guano observed	
Cache Bar Mine		3/20/95	ds	1s	54	guano observed	
Upper Cave Gulch Mine		7/5/93	ds			Plecotus townsendii	1 roosting
Middle Cave Gulch Mine		7/7/93	ds			none	
Lower Cave Gulch Mine		7/7/93	ds			Myotis lucifugus	maternity colony
Liiestone Point Mine		7/8/93	ds			Plecotus townsendii	1 roosting
Liiestone Point Mine		3/20/95	ds	15	54	none	
Limestone Point Cave		7/8/93	ds			Plecotus townsendii	1 roosting
Limestone Point Cave		3/20/95	ds	1s	54	none	

[1] ds = Day time search of cave or mine shaft.
mn = Nocturnal mist-netting at mine entrance.

Table 19. Mist net bat surveys of ponds, ripariau areas, and buildings at Craig Mountain, 1993 and 1994.

Location	Date	Species captured	Number	Comments
Benton Meadows stock pond	7/3/93	Lasionycteris noctivagans Lasiurus cinereus Myotis lucifugus	4 females, 1 male 3 males lmale	2 nets, 1st bat captured 2220
Cottonwood Creek	7/5/93	none	0	3 nets all night
Benton Meadows stock pond	7/6/93	Lasionycteris noctivagans Lasiurus cinereus Myotis lucifugus Myotis evotis	2 females, 3 males 1 male lmale 1 male	4 nets, 1st bat captured 2220
Billy Creek riparian area and barn	7/8/93	Myotis yumanensis Myotis lucifugus	lmale 4 males, 4 females	Bats captured 2140-2345
Salmon R., 1.2 mi. NE China Cr.	7/18/94	Myotis lucifugus Pipistrellus hesperus	1 1	5 nets
Salmon River at mouth	7/18/94	Lasionycteris noctivagans	1	3 nets
Snake River at Cottonwood Cr.	7/19/94	Pipistrellus hesperus	1	3 nets
Deer Cr. at Larrabee Meadows	7/21/94	none	0	5 nets, likely ultrasonic detection of E. fuscus, L. cinereus
Captain John Pond	7/22/94	Lasionycteris noctivagans Eptesicus fuscus Myotis evotis Myotis volans		3 nets
Frye Point Spring	7/24-25/94	Plecotus townsendii Eptesicus fuscus Myotis thysanodes Lasionycteris noctivagans		3 nets
Zaza buildings	7/27/94	Plecotus townsendii Myotis volans	>3	6 nets

abandoned buildings in July, but several bats (unknown spp.) were observed roosting during the day in the barn at the Eagle Creek bridge, 17 June 1994. Bat use of the Billy Creek barn

as a night roost in July 1993 was also documented. Nocturnal and diurnal bat use of barns and abandoned buildings at Craig Mountain may vary seasonally.

Management of habitat for Townsend's big-eared and other bats would include management of human activity at mines, caves or buildings used as roost sites, hibemacula, or maternity colonies (Pierson et al. 1991, Brown and Berry 1991). Conservation of bat populations should also be addressed in management actions such as mine reactivation or closure, chemical applications, and prescribed burning in and around potential roosting habitat. Intermittent bat use of abandoned buildings should be considered in the timing of restoration or demolition projects.

Distribution of specific information on bat roosting, breeding, and hibernating areas should be-limited because of the high potential for disturbance and/or vandalism. However, public information programs could be developed on bat ecology, to dispel some of the myths concerning bats, and to provide an understanding of their role in the ecosystem.

WESTERN TOAD

Western toads are widely distributed throughout the western U.S. Although most common near wetlands and riparian areas, they may travel overland through dry forests and shrublands. Breeding occurs in lakes, ponds, wetlands, backwaters, and slow-moving streams. True toads, such as the western toad, secrete toxins from the parotoid glands located behind their eyes and other glands located in warts on the surface of their skin in order to deter predators (Nussbaum et al. 1983).

Results

Western toads were captured at all pitfall trap sites in wet meadows and one white alder riparian site (AL2, Fig. 9, Tables 12 and 13). Western toads were the most widely distributed amphibian at Craig Mountain, with breeding occurring in upland ponds and wetlands, along streams, and in the low elevation backwaters of the Salmon and Snake Rivers (Llewellyn and Peterson 1995).

Conclusions

Western toads occur commonly at Craig Mountain in both natural and altered habitats. They appear able to coexist with introduced fish populations and regulated river flows. Naturally-occurring toxins may protect the tadpoles from predation. Western toads have disappeared from areas in Colorado, western Washington, and the North Cascades. Abundant populations have become extinct over the period of a few years (Leonard et al. 1993). Therefore, selected western toad populations across an environmental gradient at Craig Mountain should be monitored in order to document local and regional changes in distribution and abundance.

RINGNECK SNAKE

Ringneck snakes occur in open forest, grass- and shrublands, riparian areas and rocky areas. They are usually found under rocks and logs, and are seldom observed in the open. They occur in southwestern Idaho; north to Latah county (Potlatch River), as well as southeastern Idaho (Nussbaum et al. 1983, Idaho Conservation Data Center). Little information is available on ringneck snakes in Idaho.

Methods

Snakes were surveyed by using funnel trap and drift fences arrays at 12 sites, and by ground searches in potential habitat (Llewellyn and Peterson, unpubl. data). No ring-necked snakes were captured in funnel traps. A single incidental sighting was recorded in the grasslands in lower China Creek (UTME 521000, UTMN 5092000).

Conclusions

Ringneck snakes probably occur in grasslands, shrubby draws, riparian and rocky areas, and possibly low elevation coniferous forests at Craig Mountain. More information is needed on distribution. The primary conservation concern for most snakes 'species is protection of their hibemacula. No snake hibemacula were located in this study, however location of hibemacula is a potential short term project that could be conducted in cooperation with herpetologists at Idaho State University or elsewhere. Location of hibemacula could provide useful information on a number of snake species, since multiple species will often hibernate together.

GREAT GRAY OWL

Great gray owls are relatively uncommon throughout their range. They occur in mixed conifer forests and generally hunt in wet meadows, forest openings, selectively logged stands or clearcuts (Bull et al. 1988b, Johnsgard 1988, Duncan and Hayward 1994). Great gray owls prey almost entirely on rodents. Primary prey during spring and summer in Oregon, southeastern Idaho, and Montana are voles (*Microtus* spp.) and pocket gophers (*Thomomys* spp.) (Tryon 1943, Franklin 1987, Bull et al. 1988a, Johnsgard 1988, Duncan and Hayward 1994).

Great gray owls nest in broken-top snags and abandoned stick nests built by other raptors (often vacated goshawk nests) or corvids. As with most owls, there is no evidence that they create a nest by modify the existing nest site to any significant degree. Nests occur in all forest types, usually in mature, unlogged stands, presumably where large snags and deserted goshawk nests are more abundant.

Male great gray owls call yearround, but are most vocal during establishment of

breeding territories starting in February or March, depending on elevation and snow conditions (Franklin 1987). Calling rates decline once the female has laid eggs and is incubating (usually in April and May), then increase again once the young have left the nest in early summer (Atkinson 1989). Calls can be heard up to a distance of about 500 m.

Methods

Surveys were conducted during late February and March by playing tape-recorded great gray owl calls approximately every 800 m along transects covered on snowmobile after dusk in upland forest areas. Surveys were conducted along most groomed snowmachine routes on Craig Mountain. All owl responses were recorded. One playback survey was also conducted in April along road 575 from Black Pine to Soldiers Meadows.

Results

No great gray owls responded to playback surveys in February or March. One response was received to a playback in April. Other owls responding included saw-whet, great-homed, and barred owls. All other great gray owl observations were incidental sightings. An adult and 3 fledglings were observed in mid-June, presumably near a nesting area (Table 20).

Conclusions

Low numbers of great gray owls nest on Craig *Mountain* in mesic upland forest areas. Great gray owls also use wet meadows and forest openings at Craig Mountain for feeding. Forest management will influence great gray owl populations by influencing nest site and prey numbers and availability. Because great gray owls do not construct their own nests they rely on nests built by hawks and corvids, and on natural platforms. Pathogens such as mistletoe can result in branching conditions that provide ideal base structures for stick nests built by hawks and corvids, that can later be used by great gray owls. Large broken-top snags can also provide suitable nest sites. Forest openings - either natural or logged areas are usually preferred for foraging (Duncan and Hayward 1994).

This species is conspicuous, relatively approachable, and is active during the day. Great gray owls would be susceptible to incidental shooting, and probably benefit from yearround road closures. Winter playback surveys were not very successful at detecting great gray owls. It may be more productive to conduct playback surveys in wet meadows and surrounding forest during April or to conduct daylight searches during the nestling period in May and early June.

Table 20. Great gray owl observations at Craig Mountain, 1993 and 1994.

Location	Date	UTME	UTMN	Observation type
Black Pine Comer, along road	5/26/93	516200	5111600	1 adult
E. of Black Pine comer	4/10/94	516600	5111210	1 adult
E. of "Mud Bog"	4/19/94	518080	5111810	Response to tape playback
S. of Black Pine comer	5/1/94	516160	5111200	1 adult
S. of Black Pine comer	5/16/94	516160	5111200	1 adult
S. of Black Pine comer	5/18/94	515810	5111260	1 adult
SE of Kmze meadow, between bird survey points 1206 and 1207	6/9/94	518700	5108550	1 adult
SE of Kruze meadow, between bird survey points 1206 and 1207	6/15/94	518830	5108560	1 adult
SE of Kruze meadow, between bird survey points 1206 and 1207	6/16/94	518760	5108560	1 adult, 3 fledglings (nesting area)

FLAMMULATED *OWL*

Flammulated owls are the only neotropical migratory forest owl that breeds in Idaho. Flammulated owls are thought to winter in Central America and arrive on breeding areas from early or mid-May (Reynolds and Linkhart 1987, Bull et al. 1990, Atkinson and Atkinson 1990) to the beginning of June (Hayward 1983). In some areas they are loosely colonial nesters (Winter 1979, Moore and Frederick 1991). In the northern Rocky Mountains they nest in mature to old growth ponderosa pine and Douglas-fir forest stands with open canopies, multiple canopy layers, and low tree density. Average nest tree dbh in Oregon is 22 - 28 in (Goggans 1985, Bull et al. 1990). Although these habitat characteristics are typically associated with unmanaged stands, flammulated owls have been located in selectively logged areas (McCallum and Gehlbach 1988, Shepherd and Servheen 1992). Flammulated owls forage in open forest, along forest edge, and in grassland almost entirely on insect prey, particularly moths, caterpillars, beetles, crickets, and grasshoppers (Marshall 1957, Ross 1969, Goggans 1985). Prior to this study, flammulated owls were known to occur to the south of Craig Mountain on the Hells Canyon National Recreation Area (Moore and Frederick 1991) and the Salmon River Ranger District, Nez Perce National Forest (Shepherd and Servheen 1992).

Methods

Flammulated owls were surveyed from 15 June to 14 July 1993 by broadcasting tape-recorded calls at survey points from 2145 - 0120 along 3 transects in upland and canyon forests. Transects were surveyed once or twice. Calls were broadcast 3 times for about 1 minute at each point or until an owl responded, whichever came first. A compass bearing was taken for all owls heard and where possible, calling locations were estimated by triangulation.

Results

Flammulated owls responded to tape playback surveys at 9 of 30 survey points on transects along Wapshilla Ridge, upper Eagle Creek, and China Saddle (Table 21). Other owls responding to the playback included great-homed and barred owls.

Table 21. Approximate locations of flammulated owl responses to tape playback surveys at Craig Mountain, 1993.

Location	Date	Time	UTME	UTMN
Upper Eagle Creek	06/15/93	2234	515400	5100100
Upper Eagle Creek	06/15/93	2322	514200	5102000
Upper Eagle Creek	06/24/93	2325	515000	5100750
Upper Eagle Creek	06/25/93	0055	514000	5098850
Upper Corral Creek	06/28/93	2320	511000	5102000
Upper Corral Creek	07/01/93	1120	511300	5 101700
Upper S. Fork Captain John Creek	07/01/93	2400	512600	5104300
Upper Eagle Creek	07/02/93	0030	512600	5102900
Upper Eagle Creek	07/07/93	2400	512500	5100900
Upper Corral Creek	07/07/93	0107	511500	‘5098500
Upper Eagle Creek	07/14/93	2257	513000	5 103000

Conclusions

Flammulated owls occur and likely nest on Craig Mountain. Flammulated owls are secondary cavity-nesters and rely on cavities excavated by woodpeckers, usually pileated woodpeckers or northern flickers, for nesting. Snag densities and abundance of mature or old growth Douglas-fir and ponderosa pine forest are important components of flammulated owl habitat (McCallum 1994).

NORTHERN PYGMY-OWL

Northern pygmy-owls are residents of forested areas in western North America and Central America. They are a secondary cavity-nester, and use a wide range of forest types, usually occurring in more open forests or near meadows and clearings.

Results

No northern pygmy-owls were recorded during nocturnal tape playback surveys for other owl species. Several pygmy owls were located during breeding bird surveys and incidentally (Table 22).

Table 22. Observations of northern pygmy-owls at Craig Mountain, 1993 and 1994.

Location	Date	UTME	UTMN'	Observation
Upper S. Fork Capt. John Cr., bird survey point 5504	3/25/94	512150	5105050	1 owl calling
Upper S. Fork Capt. John Cr., bird survey point 4101	4/2/94	511953	5105108	1 owl calling
Upper Capt. John Cr., bird survey point 3208	4/18/94	512750	5108150	1 owl calling
Upper Capt. John Cr., bird survey point 3209	4/23/94	512500	5108200	1 owl calling
Benton Meadows	5/1/94	514500	5107600	1 owl calling
Upper Capt. John Cr., bird survey point 3209	5/9/94	512400	5108300	1 owl calling

Conclusions

Northern pygmy-owls occur and probably nest in open forest areas on Craig Mountain. The species may be more common than suggested by the few incidental sightings

and observations during breeding bird surveys, because neither of these methods is very efficient at detecting this species. Northern pygmy-owls are forest generalists and prefer areas with low to moderate canopy coverage (Johnsgard 1988). These habitats currently appear to be abundant at Craig Mountain.

WHITE-HEADED WOODPECKER

White-headed woodpeckers inhabit mature to old growth ponderosa pine or mixed ponderosa pine Douglas-fir stands in their northern range (Ligon 1973, Bull 1980), which includes Idaho. They are cavity nesters, usually selecting completely dead snags for nest sites (Milne and Hejl 1989, Frederick and Moore 1991). They feed mainly on ponderosa pine seeds and also forage for insects in bark crevices (Ligon 1973, Bull 1980). White-headed woodpeckers have been observed on the Garden Creek Preserve (Neiman 1987) and at Waha Lake (Ligon 1973).

Methods

Limited tape playback surveys for white-headed woodpeckers were conducted from April to the end of May, 1993. Breeding bird point count surveys were also conducted in potential habitat from March'- July, 1993 and 1994.

Results

No white-headed woodpeckers were documented during playback surveys. One observation was made during a breeding bird survey, and one incidental sighting was reported (Table 23).

Table 23. White-headed woodpecker observations at Craig Mountain, 1993 and 1994.

Location	Date	UTME	UTMN	Observation
Swamp Creek, bird survey point 2103	4/28/94	518204	5103776	1 male
Dough Creek	6/94	508500	5105600	2 birds

PYGMY NUTHATCH

Pygmy nuthatches are yearround residents of older stands of ponderosa pine. They are cavity nesters and depend on large diameter snags for nesting and roosting. During the nesting season (starting in early April) they can be communal with one to three "helpers" (usually yearling males) assisting at the nest. Each breeding pair occupies a territory of about 4.9 ac (2 ha). During the nonbreeding season up to 150 individuals have been reported roosting in the same cavity (Hutto 1989).

Results

No pygmy nuthatches were located during breeding bird surveys, or during several searches and playback surveys in potential habitat. However, one incidental observation of 3 pygmy nuthatches was recorded on 8/5/94 near breeding bird survey transect EO8 at Frye point (UTME 516350, UTMN 5096800).

Conclusions

Pygmy nuthatches were not observed during breeding bird surveys, nor during several surveys of potential habitat, although they occur on Craig Mountain. They are apparently rare, and may be confined to upper elevation ponderosa pine and Douglas-fir stands. Snag densities in ponderosa pine and Douglas-fir forests are important components of pygmy nuthatch habitat.

SUMMARY

Special status animals were found in every major vegetation type at Craig Mountain. Of the 15 species documented, 10 (67%) use the upland forest, 7 (47%) use the canyon forests, 9 (60%) use riparian habitats, 4 (27%) use rocky breaks, 4 (27%) use aquatic habitats, 3 (20%) use wet meadows, 2 (13%) use shrubby draws, and 1 (7%) uses grasslands (all species use more than 1 habitat type)., Most species with special state or federal classification were infrequently observed at Craig Mountain. The exceptions were the widely distributed spotted frog and western toad. Craig Mountain and the Salmon and Snake River canyons as a whole also appear to contain large populations of a number of bat species, including Townsend's big-eared bats and fringed myotis.

Upland forest management will directly affect the most rare animals: northern goshawk, great gray owl; flammulated owl, northern pygmy-owl, white-headed woodpecker, pygmy nuthatch, tailed frog, and possibly mountain quail, Townsend's big-eared bat, and fringed myotis. Guidelines incorporating special status species habitat requirements would be useful for management of timber harvest activities.

Riparian management will affect amphibians, mountain quail, and bald eagles. Water quality, temperature, hiding cover, and lack of introduced predators are important to

amphibians. Riparian vegetation provides wintering habitat for mountain quail and bald eagles. Distribution and availability of fish, waterfowl, and carrion will also affect bald eagle distribution. Management of rocky breaks, roosting areas, and hibemacula will affect snake and bat species. Interagency habitat conservation assessments and management strategies are currently being developed for many rare animals in Idaho; These contain additional biological information and management guidelines applicable to Craig Mountain.

Five rare species not observed during this inventory were identified as possibly occurring at Craig Mountain (Table 8). Inadequate surveys were conducted for the pygmy shrew, northern flying squirrel, and spotted bat. Taxonomic ambiguities prevented Positive identification of the California myotis. Peregrine falcons were targeted in raptor surveys conducted during 1993 and 1994. None were observed and it is unlikely that peregrine falcons currently nest at Craig Mountain. However, since 1988, over 100 peregrine falcons have been hacked from several sites in the vicinity of Craig Mountain, including Hells Canyon, Grave Point, Idaho and Asotin, Washington. This species is increasing in range and abundance throughout Idaho, and it is not unlikely that peregrine falcons will be found at Craig Mountain in the future.

The extensive nature of this inventory limited the amount of time spent on rare species. Therefore, with a few exceptions, current information is restricted to presence and limited data on habitat associations. Additional surveys for rare animals would be useful to accurately determine the distribution of most species. An accurate vegetation map will help in prediction and verification of rare animal distribution. Surveys and monitoring for the appropriate special status animals should be incorporated in to management activites that could impact these species or their habitat in order to develop site specific management plans.

Idaho's rare animal list is updated periodically as information is collected on species distribution, status, and trend. The most current list is available from the Conservation Data Center or the nongame and endangered species program.

DISTRIBUTION AND ABUNDANCE OF OTHER WILDLIFE

CARNIVORES/SCAVENGERS

Carnivores and scavengers were surveyed using 3 methods: remotely triggered cameras at bait stations (Wayment 1994), winter track transects (Richards and Phillips 1994), and scent stations, including sardine can surveys and scent pellet surveys (Phillips and Lantz 1994). Incidental sightings were also collected. Special attention was focussed on black bear (*Ursus americanus*) and marten (*Martes americana*) because of a lack of information and the interests of IDFG regional personnel.

Methods

Remote camera/bait station surveys

Infrared and motion sensitive 35 mm cameras (Manley Systems, Columbia Falls, MT) were placed at 16 bait stations, 10 June - 7 September 1993. Bait stations were distributed in a manner that would sample most areas considered to be good black bear habitat as well locations where bear use was unknown. Six stations were run concurrently for 17 - 33 days. Due to mechanical malfunctions and running out of film, cameras at each bait station operated an average of 18 days. Most sites were checked and re-baited with road-killed deer, meat scraps, and fish every 10 days.

Scent station trend surveys

Ten trend survey routes were established at Craig Mountain in 1993. Transect routes were located along roads in Wapshilla, China, Eagle, and Corral Creeks, along the 540 and Wapshilla Ridge Roads from the Stagecoach Road to Frenchy Creek (5 transects) and on the divide between the South Fork of Captain John Creek and Corral Creek (Madden Corrals - Billy Creek road). Routes were run 15 - 22 June 1993 and 9 - 15 June 1994.

Three USDA fatty acid scent (FAS) pellet transects were run from 20 June - 11 July 1994. Pellet stations were established along roads at 300-m intervals. Each station consisted of a l-m diameter circle of sifted earth. FAS pellets were placed in the center of each station and retrieved approximately 3 days later (Linhart and Knowlton 1975, Roughton 1976).

Track transects

Five snow track transects were censused on foot and by snowmachine 8 February - 2 March 1994.

Results

Remote camera/bait station surveys

Fourteen bears, including 1 sow with cubs, were photographed in 292 functioning camera-days (Table 24). Based on bear color, size, and visit time, no bear was photographed twice. Four sites had obvious bear activity, but the film was used up prior to the bears arrival, or pictures were not obtained due to camera malfunction. Two sites (Pruitt Draw and S. Cave Gulch) showed no bear activity, and 3 sites were visited by more than 1 bear. Bears visited an average of 15 days after the bait station was set up and seemed to find fish bait more quickly than deer bait.

Carnivores and scavengers other than bears were photographed at 8 sites (Table 25). Other species photographed included deer, elk, cattle, and a red squirrel.

Scent station surveys and track transects

Two bear trend survey stations of 50 were visited by bears in 1993; 1 on the Madden Corrals - Billy Creek Road, and 1 in Wapshilla Creek. 1 station of 50 was visited in 1994; on the Madden Corrals - Billy Creek Road.

FAS scent pellet stations were visited by bears, skunk, rodents, deer, and elk. Mountain lions, coyotes; and other species were observed in snow track transects (Table 26).

Incidental sightings

Black bear

Seventeen incidental sightings of black bears were recorded in 1993 and 10 were recorded in 1994 (Table 27).

Marten

Although no marten or sign were observed during surveys, there were 2 incidental observations of tracks during the project. One report was received of possible marten tracks at Fort Simmons Ridge 3/10/93 (UTME 512120, UTMN 5113400) and 1 observation of possible marten tracks was recorded in upper Captain John Creek (UTME 513100, UTMN 5 107100). Neither sighting could be confirmed.

Table 24. Black bear activity documented by cameras at bait stations at Craig Mountain, 1993.

Date	Station No.	Location	Visited?	No. Photos	Approximate Bear Size[a]	Total Days	Working Camera Days	Day Visited[b]	Bait Type[d]
6/10-7/13	1	China Saddle	Yes	0		33	20	27[b]	Deer/Fish
6/10-7/13	2	Upper Eagle Creek, SW	Yes	0	-	33	29	30[b]	Deer/Fish
6/10-7/13	3	Frye Point	Yes	1	Medium	33	22[b]	27	Deer/Fish
6/15-7/13	4	Swamp Creek	Yes	1	Small	28	27	8	Deer/Fish
6/15-7/13	5	Deer Creek	Yes	0	-	28	2	18[b]	Deer/Fish
6/23-7/13	6	Upper Eagle	Yes	1	Large	20	20	6	Fish/Fish
7/15-8/5	7	Pruitt Draw	No	-	, -	20	20		Deer/Fish
7/15-8/5	8	N. Cave Gulch	Yes	1	Large	20	20	7	Deer/Fish
7/19-8/5	9	S. Cave Gulch	No	-		17	17		Deer/Fish
7/19-8/5	10	Pine Point	Yes	2	Small/Large	18	18	18,18	Deer/Fish
7/20-8/6	11	Wapshilla Ridge	Yes	3	Sow, 2 Cubs	17	17	11,11,11	Deer/Fish
7/20-8/6	12	Wapshilla Ridge	Yes	1	Medium	17	17	7	Deer/Fish
8/10-9/8	13	Madden Creek	Yes	0	-	28	2	20[b]	Fish/Beef
8/10-9/8	14	Lower S.Fk. Captain John Cr.	Yes	1	Large	28	20	9	Fish/Beef
8/11-9/6	15	Upper S.Fk. Captain John Cr.	Yes	1	Medium	25	25	24	Fish/Pork
8/11-9/6	16	Upper Captain John Creek	Yes	2	Small/Med.	25	16	1,16	Fish/Pork
Average				-	-	24	18	15	
Total			14	14		390	292	-	

[a] Small 25-100 lbs., medium 100-175 lbs., large 175-300 lbs.
[b] Estimated.
[c] If day hit > working camera days, the film was used up prior to the bear hit. Day hit was estimated.
[d] First bait is initial type, second is rebait type.

Table 25. Carnivores and scavengers other than bears photographed by remote cameras at Craig Mountain, 1993.

Station No.	Location	Species	Bait type	Day visited
1	China Saddle	Turkey 'Vulture	Fish	20
2	Upper Eagle Creek, SW	Bobcat	Deer	2
3	Frye Point	Bobcat	Fish	25
3	Frye Point	coyote	Fish	27
4	Swamp Creek	Ravens	Deer	8
6	Upper Eagle Creek	Skunk	Fish	9
6	Upper Eagle Creek	Porcupine	Fish	13
8	North Cave Gulch	Bobcat	Fish	19
9	South Cave Gulch	Bobcat	Deer/Fish	9
10	Pine Point	Bobcat	Deer/Fish	6

Table 26. Track and FAS pellet transect observations, Craig Mountain, 1994.

Transect location	Transect type	Species observed
Waha - Sweetwater Creek	Snow track	Coyote, snowshoe hare, squirrel, rodent
Madden Corrals - Billy Creek	Snow track	Mountain lion, weasel, coyote, deer, elk, snowshoe hare
Browns Creek - S. Fork Captain John Cr.	Snow track	Coyote, snowshoe hare, grouse, rodents
Lake Creek - Fort Simmons Ridge	Snow track	Mountain lion, snowshoe hare, coyote, weasel, squirrel
Eagle Cr. - Madden Corrals - Roberts Spr.	Snow track	Coyote, snowshoe hare, rodents
Captain John Creek	FAS pellet	Coyote, deer
Upper Eagle Creek Southwest	FAS pellet	Bear, deer, rodents
Upper Eagle Creek North	FAS pellet	Deer, elk, coyote, skunk, rodent

Table 27. Incidental observations and reports of black bears at Craig Mountain, 1993 and 1994.

Date	Observation	Location	UTME	UTMN
4/4/93	2 adults	Thiessen canyon	505000	5115000
4/6/93	2 adults	Wapshilla Ridge	515200	5087300
4/6/93	1 adult	4th Creek (Eagle Cr.)	519300	5087600
4/7/93	1 adult	Frenchy Creek	514800	5082 100
5/11/93	1 adult	Billy Creek	506900	5106200
5/25/93	sow w/2 cubs	Wapshilla Ridge/ Cottonwood Cr.	514620	5088500
6/22/93	1 adult	lower Wapshilla Cr.	517300	5088500
6122193	sow w/yearling	Wapshilla Ridge	514200	5086800
6/23/93	1 adult	Upper E. Eagle Cr.	510320	5158000
6124193	1 adult	Upper Eagle Cr.	510030	5157000
6/30/93	1 adult	Eagle Creek/Swamp Creek divide	518400	5101300
8111193	1 adult	Madden Corral Rd.	509350	5104100
8/12/93	1 adult	Between Pruitt Draw and China Cr.	516750	5091220
8/19/93	1 adult	Corral Cr.	509400	5098000
10/20/93	1 yearling	above Waha	511200	5118000
10/23/93	1 adult	lower China Creek (AL3)	519552	5091725
3/1/94	sow w/2 yearlings	Above Lone Pine Cr.	510840	5084250
5/3/94	sow w/3 cubs	W. China Creek	514800	5092200
5/13/94	5 bears	S. F. Cpt. John Cr. (hunter bait site)	510500	5103650
5/18/94	1 adult	Madden Corral Rd.	511000	5102600
5/19/94	1 adult	Madden Corral Rd.	512900	5102900
5/20/94	sow w/2 cubs	Sweetwater Cr.	516500	5114800
6/1/94	1 adult	S. Fork Captain John Cr.	511500	5 105200
6/3/94	1 adult	Upper Corral Creek	511625	5098298
6/8/94	1 adult	Lower Wapshilla Creek	518400	5088800
6//94	1 adult	Lower Cottonwood Creek	512100	5088500

Discussion

Black bear

Black bears occurred at nearly all elevations, and in all major vegetation types at Craig Mountain. Bears were the most common carnivore/scavenger photographed at bait stations. Incidental sightings were not common, but bears were observed more frequently than other large carnivores. However, it took an average of 15 days for bears to visit a bait station, typical of a low density bear population in fragmented habitat. Cool, wet weather in 1993 and bait type may have also influenced the length of time it took for a bear to visit the station. The length of the average hit time may help explain the low visitation rate on sardine cans, which were only out for 5 days.

Three observations were made of sows with cubs in 1993 (1 photographed and 2 incidental observations). Two sows with cubs were also observed in 1994 (both incidental observations). A population estimation technique has been suggested for grizzly bears using the number of observations of sows with cubs and the following assumptions (U.S. Fish and Wildlife Service 1990).

1. 50:50 male:female ratio.
2. Population is 50% adults and 50% subadults.
3. 3 year reproductive interval.
4. Observability of sows with cubs = 60%

If these assumptions were applied to the observations in this study, a rough estimate of the black bear population size in the Craig Mountain study area would be 40 - 60 bears:

3 sows *w/cubs x* 3 = *9 breeding females*
(9 breeding females + 9 nonbreeding females + 18 males) / 0.6 observed = 60 bears

2 sows w/cubs *x* 3 = *6 breeding females*
(6 breeding females + 6 nonbreeding females + 12 males) 10.6 observed = 40 bears

Marten

Marten were not photographed at bait sites, nor observed in winter tracking 'surveys. Bull et al. (1992) found that marten were less likely to visit bait stations in summer than in winter, possibly because prey availability is greater during summer. However, Jones and Raphael (1993) were successful at detecting marten at summer bait stations. If additional information is desired in the future, bait station/camera sites and winter track transects could be combined by putting up camera/bait stations at possible marten track observations, and/or at the locations identified in this study. Winter tracking could provide additional information, although tracks of fisher (*Martes pennanti*) and mink (*Mustela vison) can* be confused with marten. A camera/bait station would provide positive identification.

Conclusions

A breeding population of black bears was widely distributed at Craig Mountain. Black bears were observed at all elevations and in nearly all vegetation types throughout the year. Marten were possibly present at Craig Mountain, but if so, were extremely uncommon. Marten habitat is typically characterized by mature, mesic coniferous forest with 30 - 50% crown density (Clark et al. 1987), and marten is considered a management indicator species associated with old-growth coniferous forests (Bull et al. 1992). This type of habitat is not very abundant at Craig Mountain. Marten habitat suitability could be further examined using forest vegetation data. Additional information on small mammal, particularly vole and squirrel, abundance in the upland forest would also be useful in assessing habitat suitability for marten at Craig Mountain.

SMALL MAMMALS

Rodents and shrews

Although rodents and shrews comprise a relatively little known portion of the wildlife community, these animals are likely a substantial component of the wildlife biomass in the Craig Mountain area. They affect insect and plant populations and constitute the prey base for many other species. In addition to being low on the food chain, these animals are also relatively sedentary, and may be more valuable indicators of habitat quality than other, more conspicuous species (Szaro 1988).

Methods

The primary method used to sample the small mammal community on Craig Mountain was pitfall trapping. This was supplemented by a small amount of snap trapping. No single trapping technique adequately samples the entire small mammal community. Behavior of species varies which results in dissimilar capture rates (Bury and Corn 1987, Corn et al. 1988, Szaro et al. 1988, Taylor et al. 1988, McComb et al. 1991). However, based on time constraints, the desire to sample as many species as possible (including reptiles and amphibians), and to target species of special concern (including 2 shrew species), pitfall trapping was selected as the most effective technique for this study. This method targets smaller animals (pocket gopher or smaller) and often captures younger animals as well (Szaro et al. 1988). It does not sample squirrels, chipmunks, or larger rodents.

Three replicates were established in four vegetation types in 1993. Sites were selected based on vegetative representativeness and accessibility. In addition, sites were at least 0.5 mi apart and each vegetation type contained replicates in at least 2 different drainages (Fig. 9). Vegetation types sampled in 1993 were white alder riparian, Idaho fescue grassland, Douglas-fir / ninebark forest, and wet meadows (*Carex spp./Deschampsia caespifosa*). Two of the grassland sites (IF1 and IF2) were located near long term vegetation

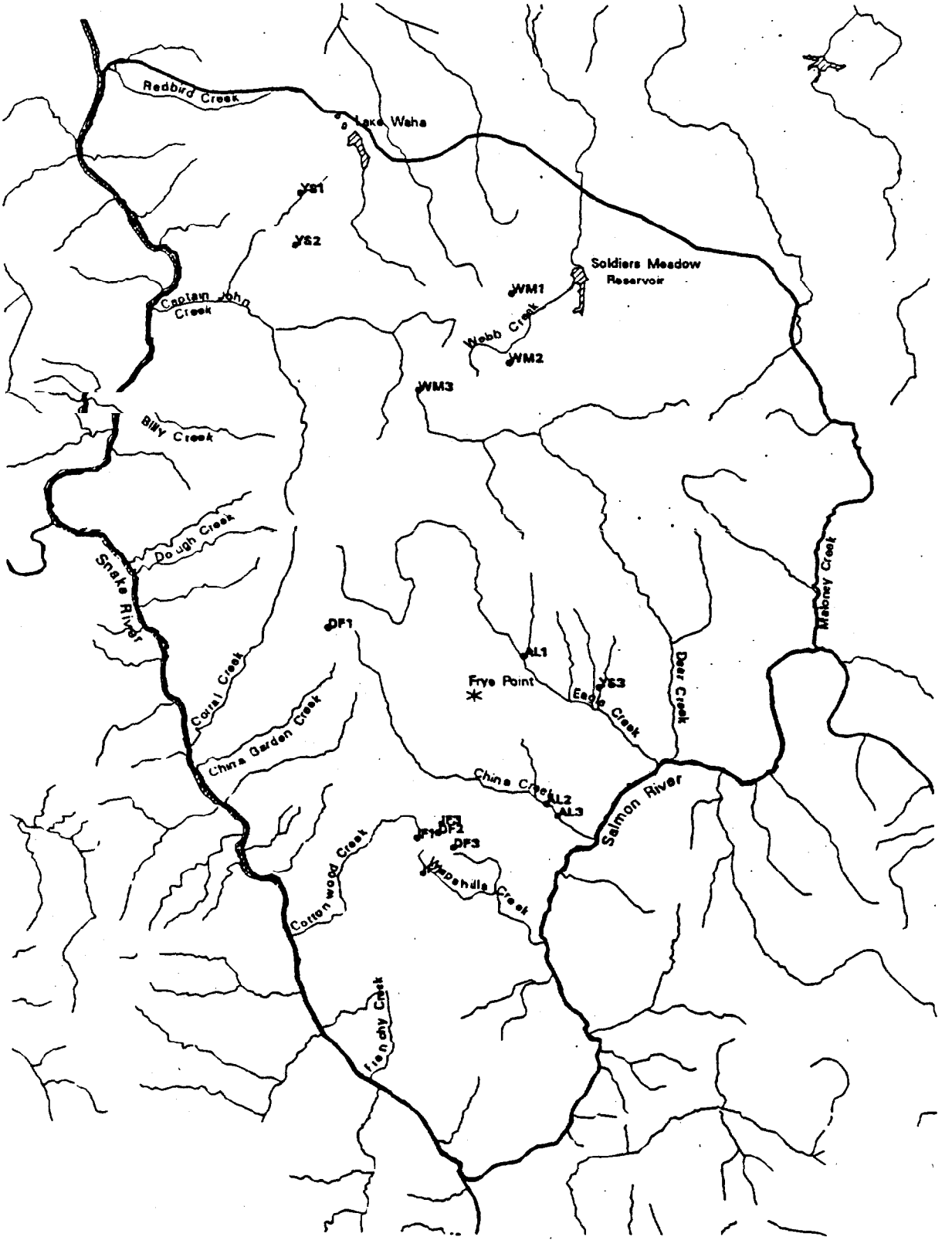

Figure 9. Pitfall trap locations at Craig Mountain, 1993 and 1994.

established by Dr. E. Tisdale (Univ. of Idaho) in the 1960's and 1970's (Mancuso and Moseley 1994). In 1994, all sites were resampled and 3 additional sites were established in yellow starthistle, for a total of 15 sites in 5 vegetation types. The starthistle sites were in bluebunch wheatgrass habitat types that had been nearly completely invaded by yellow starthistle and annual grasses, especially cheatgrass ***(Bromus tectorum)***.

A pitfall/drift fence array design (Bury and Corn 1987) was used at all sites after a design used on the Clearwater, Panhandle (Groves **1994a, 1994b),** and Boise National Forests (C. Harris, unpubl. data). Each trapping array consisted of 2 triads at least 25 m apart, with 3 pairs of pit traps connected by 5 m drift fences in each triad (12 pits/site) (Fig. 10). The drift fence was constructed of 20" aluminum valley roofing material buried about 8" deep. Each pit trap consisted of 2 number 10 cans on top of one another.

The pitfalls were **filled** with several inches of water to drown captures. However, in Idaho fescue grassland sites and lyellow starthistle site, water evaporated more rapidly than it was added, and the traps were often run dry. During 1993, when traps were checked approximately once a week, several scavengers discovered the traps, and removed animals from the cans at 2 of the riparian sites (AL2 and AL3) during the last few weeks of trapping. In 1994, traps were checked every 2 to 3 days, and this problem seemed to have been eliminated. However, due to these factors, numbers reported are minimums.

Traps were run from 20 September to 1 November 1993, and from 20 April to 12 May 1994. All cans were covered with plastic lids between the 1993 and 1994 field seasons. At the end of the 1994 season they were either turned over or filled with rocks to avoid continued trapping, as lids popped off or were removed by scavengers. All sites were permanently marked with metal fence posts.

Shrews and voucher specimens of other species were deposited at the University of Idaho Bird and Mammal Museum.

Vegetation measurements followed a methodology developed by the western heritage task force (Bourgeron et **al. 1991),** and is comparable to USFS **ecodata** plots. A description of the vegetative community and an ocular estimate of species percent cover in a 0.1 acre plot were recorded. Data were also collected on abundance and size of trees, snags, and woody debris (Mancuso and Cassirer, unpubl. data).

Trapping effort was standardized by reporting relative abundance as average number **captured/100** trap nights. An index to niche breadth for each species was calculated using a reciprocal of Simpson's index (Whittaker and Levin **1975:169).** The index was calculated as $1/\Sigma p_i^2$, where p_i = **proportion** of the species observations in the **i-th** vegetation type. This index can be used to evaluate the degree of association of species with particular vegetation types. Species with lower indices are either restricted to fewer vegetation types, or use their selected types less evenly than species with higher indices. These species may be more sensitive to habitat changes (Best et al. 1978, Stauffer et al. 1979).

Snap traps

Museum special snap trap lines were placed at 7 locations. Traps were set approximately 10 m apart. Traps in mixed conifer and grassland habitats were baited with

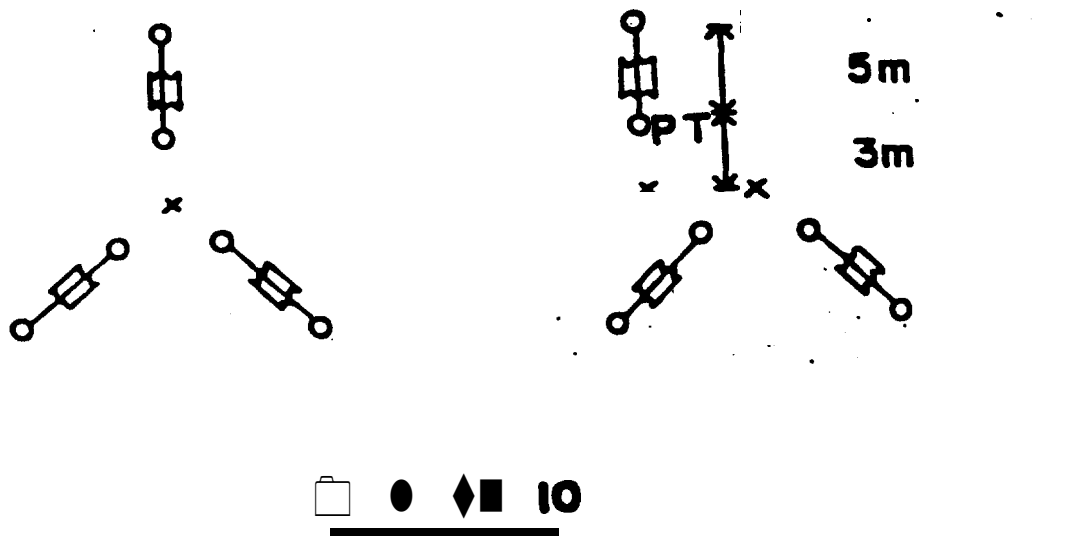

Figure 10. Pitfall trap design (from Bury and Corn 1987).

peanut butter and oatmeal. Traps in forested riparian areas targeted northern water shrews (*Sorex palustris*) and were baited with a mixture of peanut butter, bacon grease, and oatmeal. One rat trap line (12 traps) was set at Benton Meadows.

Results

Pitfall trapping

A total of 2,098 small mammals of 11 species (3 microtines, 4 insectivores, 3 mice, and a pocket gopher) were captured in 7,388 trap nights of pitfall trapping. Ten species were captured in 4 vegetation types during the fall of 1993 and 11 species were captured in 5 vegetation types in the spring of 1994 (Tables 28 and 29 and Appendix C). Capture rates were sigificantly higher in 1994 than in 1993, primarily due to large increases in montane voles and vagrant shrews, although captures of nearly all species increased (Tables 28 and 29, Fig. 10). During both years the alder riparian areas had the highest densities of small mammals and the wet meadows had the lowest (Fig. 11). Four species: the montane vole, the long-tailed vole, the vagrant shrew, and the white-footed deer mouse comprised 93% of all captures. Species richness was similar among vegetation types, with 8 species occurring in the white alder and starthistle vegetation, and 9 species occurring in the other types (Table 29). However, 1 species (the western jumping mouse) was not encountered at all during 1993, and new species were encountered up through the last night of trapping in 1994 (Fig. 12), suggesting that the trapping period may not have been long enough to include all uncommon species. One species not previously known from northern Idaho was captured. This was the Merriam's shrew which was only known from the Snake River Plain in Butte, Bannock, and Bingham counties (Allred 1973, Mullican 1986) and the South Fork of the Boise River in Elmore County, ID (Larrison and Johnson 1981). This species had also been collected in Asotin, Garfield, and Whitman counties, WA (Hudson and Bacon 1956, Diersing and Hoffmeister 1977).

During both years, the 4 most common species (montane vole, long-tailed vole, vagrant shrews, and white-footed deer mouse) dominated the small mammal community in all vegetation types (Figs. 13 and 14). The apparent relative abundance of the red-backed vole in the wet meadows in 1994 is probably due to the proximity of one replicate to the forest edge, since this species was only captured at this site (Appendix C). The least common species were generally more closely associated with specific vegetation types, and the least abundant species, the Great Basin pocket mouse, was only found in one type, the Idaho fescue grasslands (Table 30, Fig. 15).

Based on the vegetation communities sampled, 4 species can be considered relatively closely tied to a particular vegetation type (niche breadth indices equal to or less than 2, Table 30). The Great Basin pocket mouse and the Merriam's shrew were most closely associated with Idaho fescue sites, the masked shrew was associated with wet meadow sites, and the red-backed vole which was associated with forest vegetation (Table 30, Fig. 15). The species most abundant in alder riparian sites were generalists and occurred in all vegetation types sampled.

Table 28. Relative abundance (n/100 trap nights) of small mammals in 4 vegetation types at Craig Mountain, Idaho, Fall 1993.

		white Alder (n=3) 960-m'	Douglas Fir (n=3) 972 TN	Idaho fescue (n=3) 908 TN	Wet meadow (n=3) 841 TN	All types (n=4) 3681 TN
Species	n	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$ (SD)
white-footed deer mouse (*Peromyscus manicdatus*)	149	7.95 (3.47)	2.80 (2.13)	4.28 (0.40)	0.83 (0.55)	4.00 (3.01)
Great Basin pocket mouse (*Perognathus parvus*)	2	0	0	0.22 (0.19)	0	0.06 (0.11)
Montane vole (*Microtus montanus*)	208	6.21 (5.03)	2.50 (1.45)	4.28 (8.33)	6.08 (2.03)	3.27 (2.61)
Long-tailed vole (*Microtus longicaudus*)	170	a.27 (10.22)	2.53 (I. 45)	1.59 (1.10)	6.43 (2.03)	4.71 (3.17)
Red-backed vole (*Clethrionomys gapperi*)	2	0	0.10 (0.17)	0	0.12 (0.21)	0.06 (0.06)
Northern pocket gopher (*Thomomys talpoides*)	4	0	0	0.33 (0.35)	0.12 (0.21)	0.11 (0.26)
Vagrant shrew (*Sorex vagrans*)	76	1.80 (2.07)	0.93 (0.64)'	3.15 (2.39)	2.62 (1.84)	2.13 (0.97)
Masked shrew (*Sorex cinereus*)	8	0.10 (0.28)	0.31 (0.32)	0	0.47 (0.20)	0.22 (0.21)
Merriam's shrew (*Sorex merriami*)	10	0.31 (0.01)	0	0.73 (0.75)	0	0.26 (0.35)
Dusky shrew (*Sorex monticolus*)	1	0.00 (0.00)	0	0	0.12 (0.21)	0.03 (0.06)
$\bar{X}$ captures/100 TN		24.65 (20.14)	9.16 (2.93)	18.64 (5.03)	16.79 (7.59)	17.36 (6.40)
No. species		6	6	7	8	10

' T N = trap nights.

Table 29. Relative abundance (n/100 trap nights) of small mammals in 5 vegetation types at Craig Mountain, Idaho, Spring 1994.

Species	n	White Alder (n=3) 735 TN[1] x (S.D.)	Douglas Fir (n=3) 792 TN X (S.D.)	Idaho fescue (n=3) 805 TN X (S.D.)	Wet meadow (n=3) 682 TN X (S.D)	Yellow starthistle (n=3) 756 TN X (S.D.)	All types (n=5) 3770 TN X (S.D.)
White-footed deer mouse (*Peromyscus maniculatus*)	242	10.50 (4.32)	3.66 (1.19)	4.82 (0.77)	0.14 (0.83)	12.57 (6.84)	7.11 (4.13)
Western Jumping Mouse (*Zapus princeps*)	51	3.81 (0.21)	0.25 (0.44)	0	0.69 (0.86)	2.12 (1.83)	1.37 (1.59)
Great Basin pocket mouse (*Perognathus parvus*)	1	0	0	0.13 (0.23)	0	0	0.03 (0.04)
Montane vole (*Microtus montanus*)	494	21.84 (12.56)	12.37 (3.58)	20.14 (4.97)	1.56 (1.34)	8.60 (4.07)	12.90 (8.36)
Long-tailed vole (*Microtus longicaudus*)	203	8.13 (6.28)	8.21 (2.43)	4.50 (1.15)	1.30 (1.47)	4.23 (1.50)	5.27 (2.93)
Red-backed vole (*Clethrionomys gapperi*)	17	0	0.51 (0.58)	0	1.79 (3. 10)	0	0.46 (0.78)
Northern pocket gopher (*Thomomys talpoides*)	9	0.13 (0.23)	0.13 (0.22)	0.24 (0.42)	0.41 (0.42)	0.26 (0.46)	0.23 (0.12)
Vagrant shrew (*Sorex vagrans*)	412	29.15 (6.73)	6.19 (2.74)	9.48 (3.01)	2.42 (1.42)	7.67 (4.80)	10.98 (I0.48)
Masked shrew (*Sorex cinereus*)	21	0.13 (0.23)	0	0.13 (0.23)	2.66 (2.09)	0.13 (0.23)	0.61 (1.15)
Merriam's shrew (*Sorex merriami*)	6	0	0.13 (0.22)	0.65 (0.83)	0	0.13 (0.23)	0.26 (035)
Dusky shrew (*Sorex montiwlus*)	8	0.26 (0.23)	0.51 (0.58)	0.12 (0.21)	0.14 (0.24)	0	0.21 (0.29)
$\bar{X}$ capture-s/100 TN		73.82 (14. II)	31.94 (6.69)	37.43 (9. 61)	11.11 (8.48)	35.71 (7.97)	38.56 (22.64)
No. species		8	9	9	9	8	11

[1] TN = Trap nights.

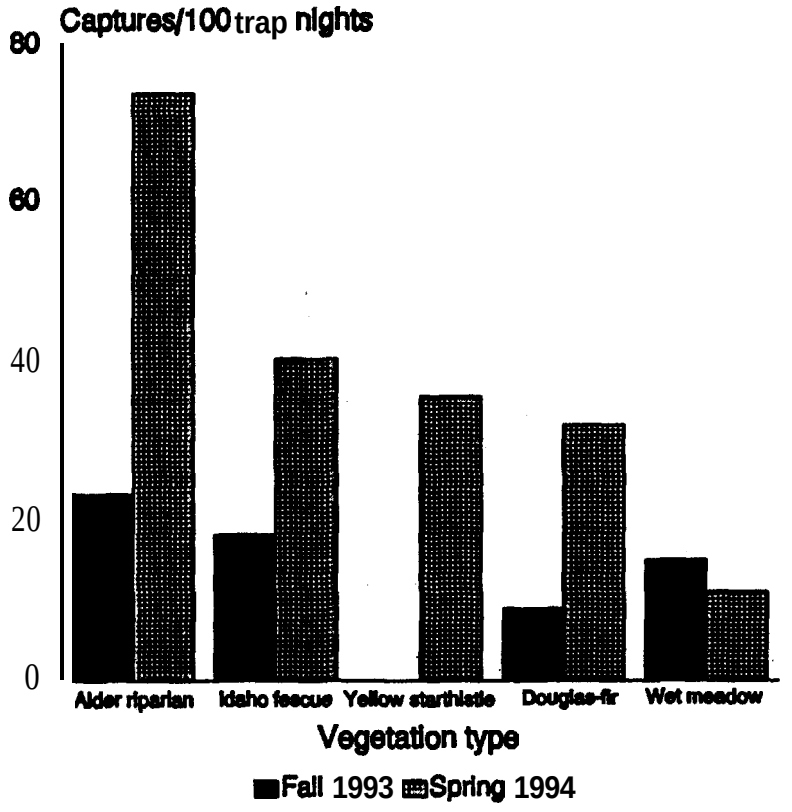

Figure 11. Relative abundance of small mammals in 5 vegetation types[1] at Craig Mountain, fall 1993 and spring 1994.

[1] Yellow starthistle was only sampled during the spring of 1994.

A simple predictive model was developed based on pies' occurrence at 3 replicates in each vegetation type (Table 3 1). This could be refined with the addition of physical and vegetation data available in the GIS such as elevation, aspect, and proximity to other vegetation types.

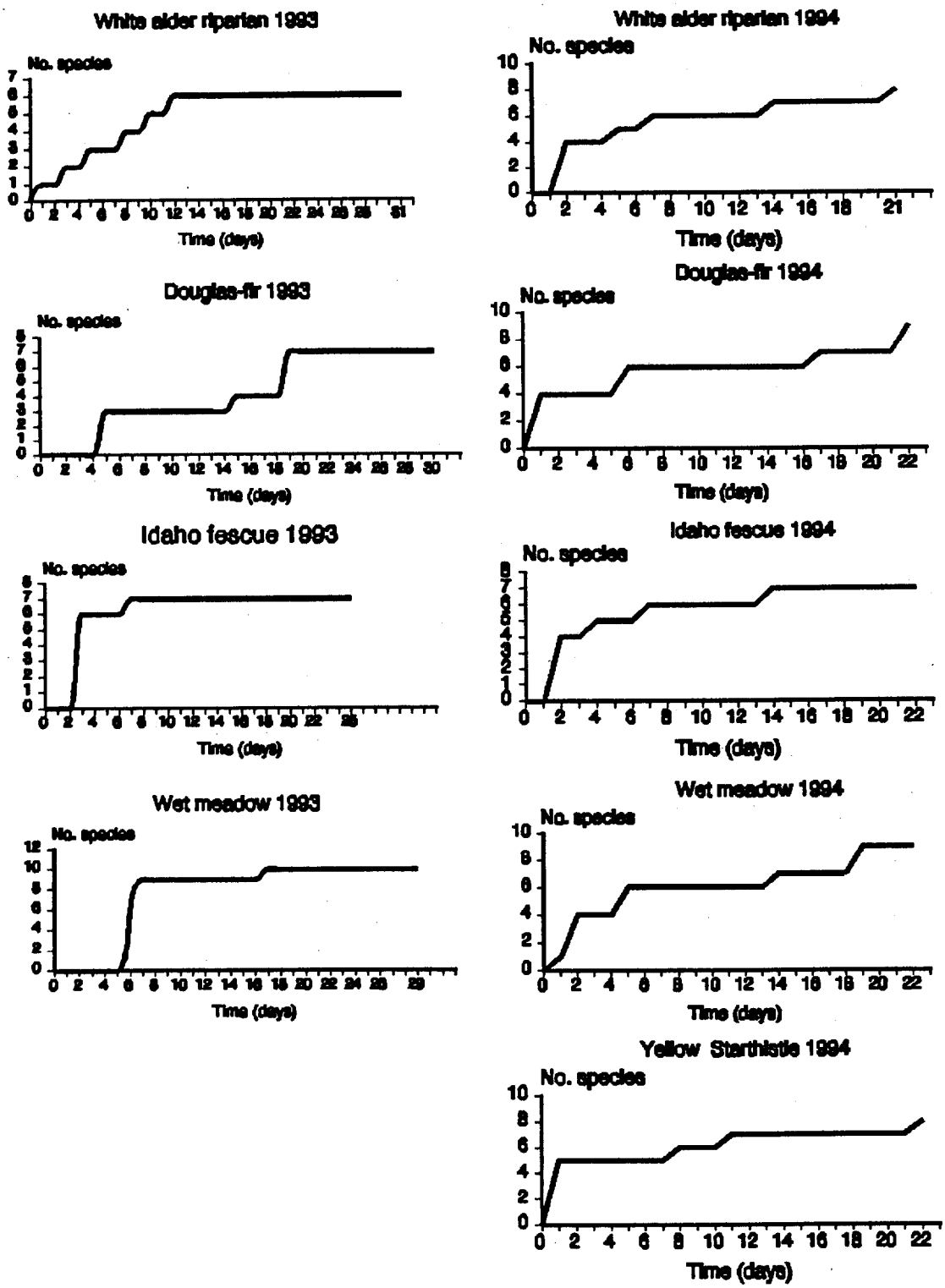

Figure 12. **Cumulative number of small mammal species captured in pitfall traps at Craig Mountain, fall 1993 and spring 1994.**

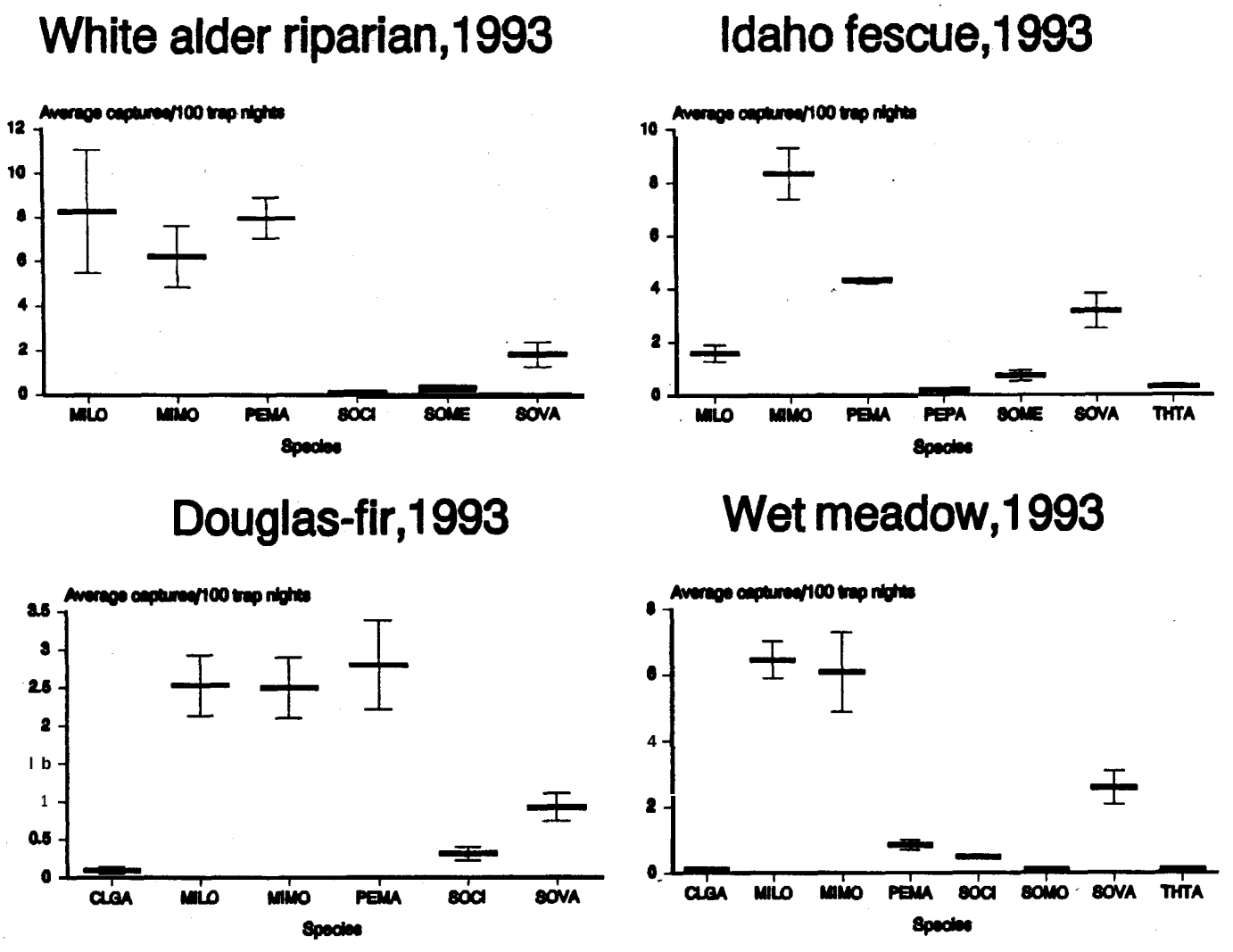

Figure 13. Relative abundance' of 10 small mammal species[2] in 4 vegetation types at Craig Mountain, fall 1993.

[1] Mean and 80% confidence interval.

[2] CLGA=*Clethrionomys gapped,* MILO=*Microtus longicaudus*, MIMO=*Microtus montanus*, PEMA=*Peromyscus maniculatus*, PEPA=*Perognathus parvus*, SOCI=*Sorex cinereus*, SOME=*Sorex merriami*, SOMO=*Sorex monticolus*, SOVA=*Sorex vagrans*, THTA=*Thomomys talpoides*.

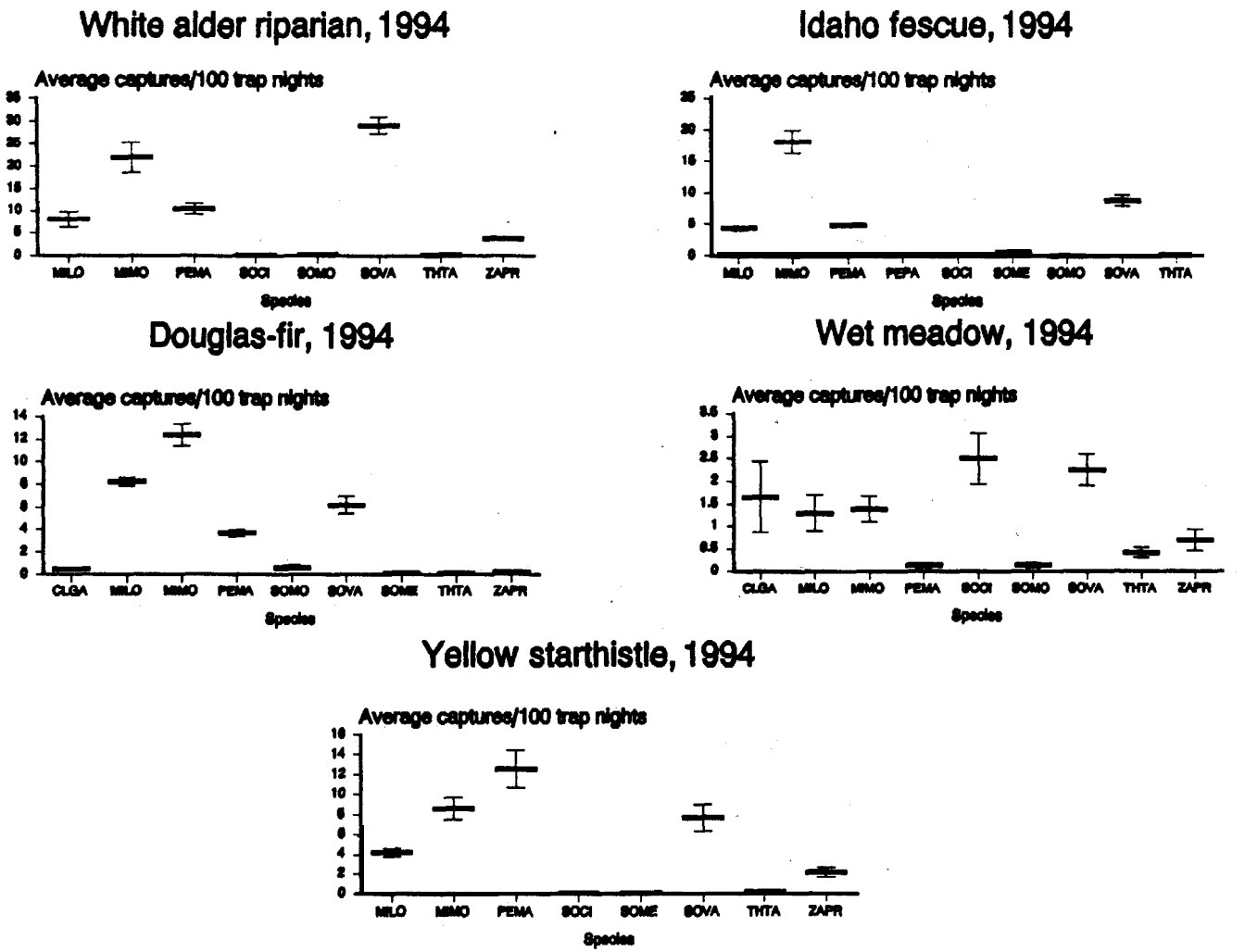

Figure 14. Relative abundance' of 11 small mammal specie8 in 5 vegetation types at Craig Mountain, spring 1994.

[1] Mean and 80% confidence interval.

[2] CLGA=*Clethrionomys gapperi*, MILO=*Microtus longicaudus*, MIMO=*Microtus montanus*, PEMA=*Peromyscus maniculatus*, PEPA=*Perognathus parvus*, SOCI=*Sorex cinereus*, SOME=*Sorex merriami*, SOMO=*Sorex monticolus*, SOVA=*Sorex vagrans*, THTA=*Thomomys talpoides*.

Table 30. Niche breadth of 11 small mammal species in S vegetation types at Craig Mountain, Idaho, 1993 and 1994.

Species	Foraging guild	n	Number of vegetation types with captures	Vegetation type with greatest percentage of captures	Niche breadth index (Range 1-5)
White-footed deer mouse (*Peromyscus maniculatus*)	omnivore	391	5	Yellow starthistle	3.3
Western jumping mouse (*Zapus princeps*)	omnivore	51	4	Yellow starthistle	2.4
Vagrant shrew (Sorer *vagrans*)	Insectivore	481	5	Alder riparian	3.7
Montane vole (*Microtus montanus*)	Herbivore	685	5	Alder riparian/ Idaho fescue grasslands	4.4
Long-tailed vole (*Microtus longicaudus*)	Herbivore	372	5	Alder riparian/ Douglas Fir forest	4.4
Merriam's *shrew* (*Sorex merriami*)	Insectivore	17	4	Idaho fescue grasslands	2.1
Great Basin pocket mouse (*Perognathus parvus*)	Granivore	3	1	Idaho fescue grasslands	1.0
Dusky shrew (*Sorex monticolus*)	Insectivore	9	4	Douglas fir forest	3.3
Masked shrew (*Sorex cinereus*)	Insectivore	28	4	wet meadow	1.8
Northern pocket gopher (*Thomomys talpoides*)	Herbivore	13	5	Grassland/Wet meadow	3.8
Red-backed vole (*Clethrionomys gapperi*)	Herbivore	18	2	Wet meadow/Douglas Fir forest	1.6

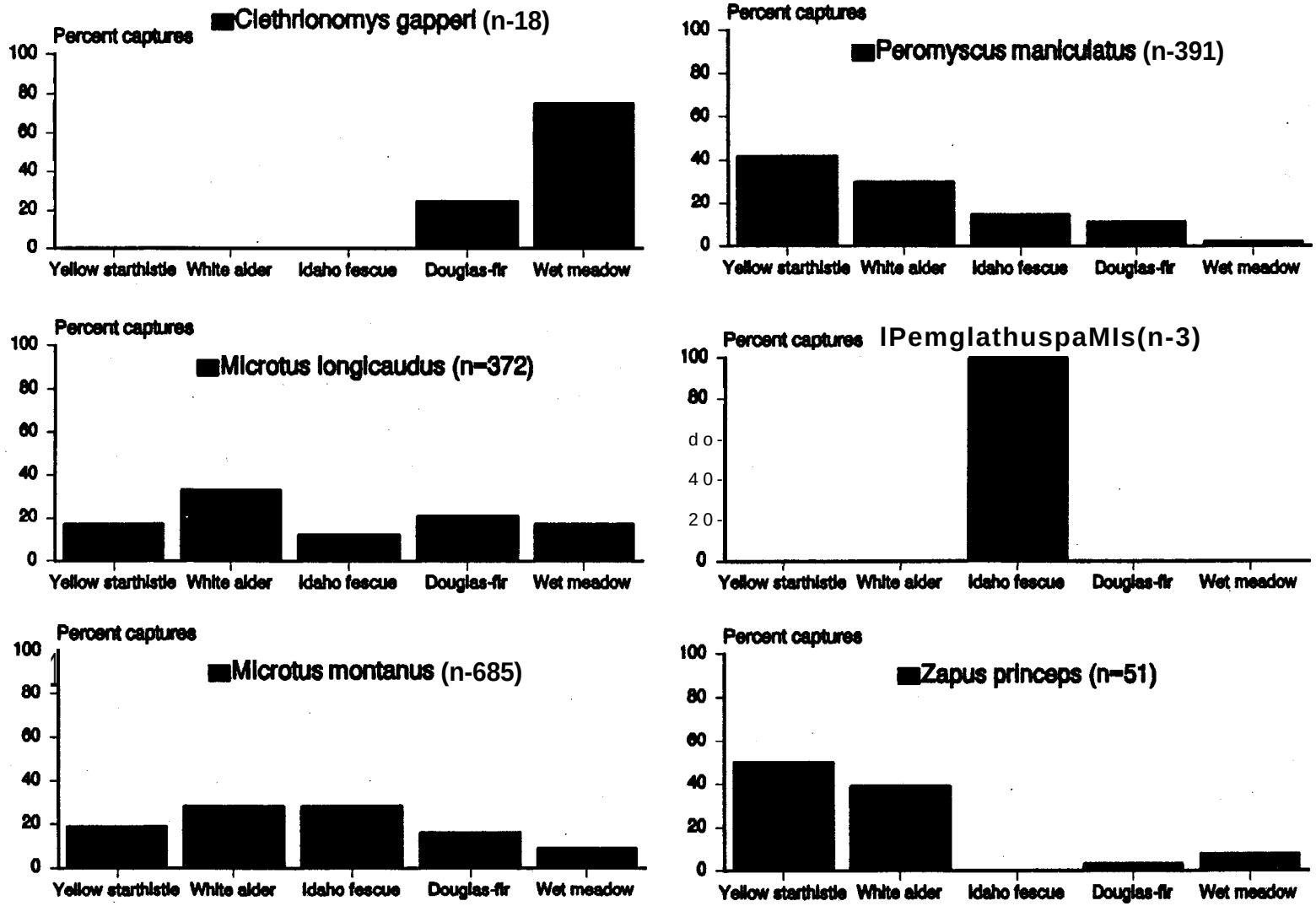

Figure 15. Small mammal pitfall trap captures in S vegetation types at Craig Mountain, 1993 and 1994.

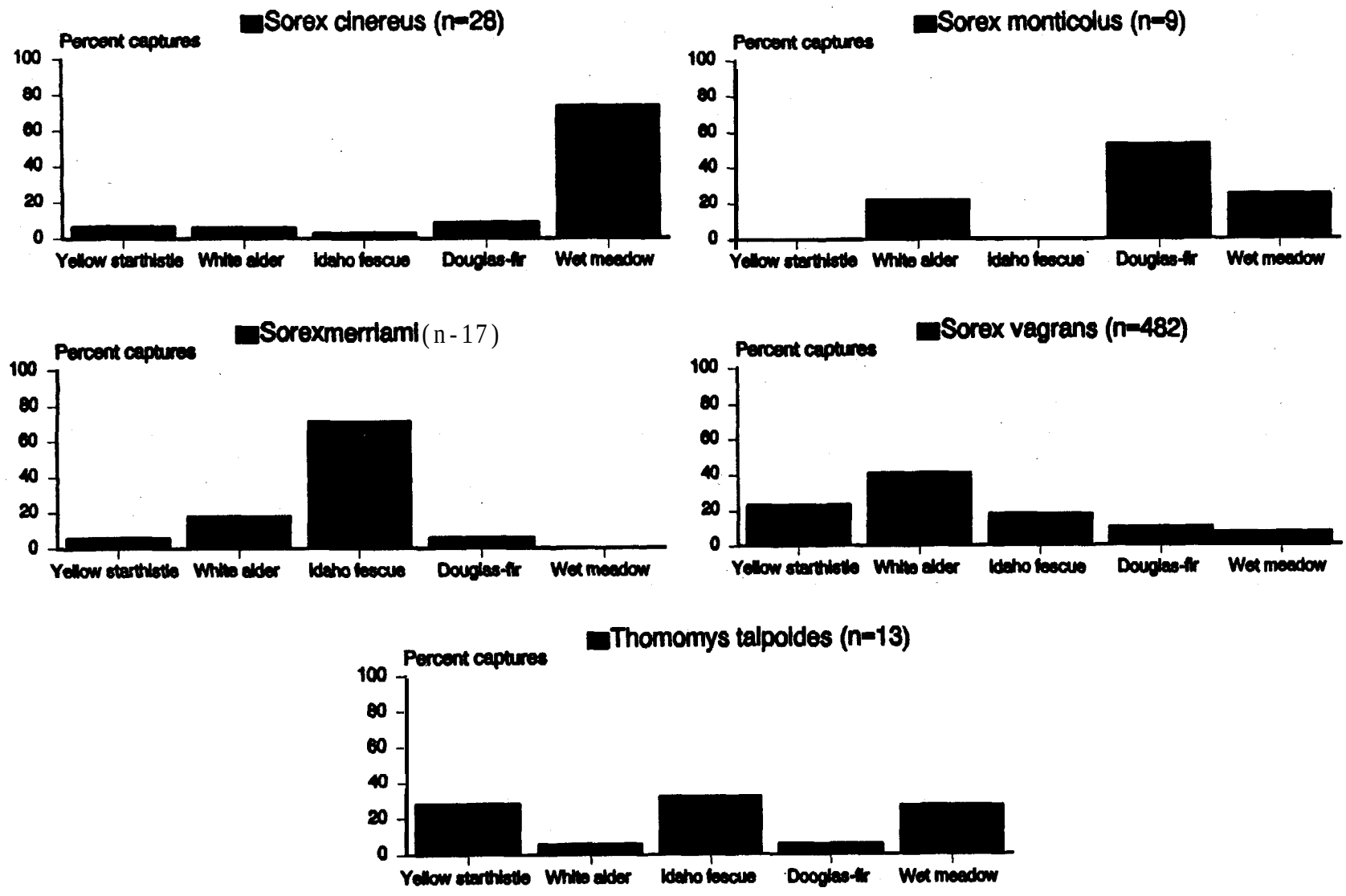

Figure 15 cont'd. Small mammal pitfall trap captures in S vegetation types at Craig Mountain, 1993 and 1994.

Table 31. Probability of occurrence of 11 small mammal species in 5 vegetation types at Craig Mountain, 1993 and 1994.

	White Alder	Douglas Fir	Idaho fescue	wet Meadow	Yellow starthistle
White-footed deer mouse (*Peromyscus maniculatus*)	1.00	1.00	1.00	1.00	1.00
Western Jumping Mouse (*Zapus princeps*)	1.00	0.33	0	0.67	0.67
Great Basin pocket mouse (*Perognathus parvus*)	0	0	1.00	0	0
Montane vole (*Microtus montanus*)	1.00	1.00	1.00	1.00	1.00
Long-tailed vole (*Microtus longicaudus*)	1.00	1.00	1.00	1.00.	1.00
Red-backed vole (*Clethrionomys gapperi*)	0	0.67	0	0.33	0
Northern pocket gopher (*Thomomys talpoides*)	0.33	0.33	0.33	0.67	0.33
Vagrant shrew (*Sorex vagrans*)	1.00	1.00	1.00	1.00	1.00
Masked shrew (*Sorex cinereus*)	0.33	0.67	0.33	1.00	0.33
Merriam's shrew (*Sorex merriami*)	1.00	0.33	1.00	0	0.33
Dusky shrew (*Sorex monticolus*)	0.67	0.67	0.33	0.33	0

Snap trapping

Snap traps captured 137 small mammals of 6 species in 516 trap nights. Seventy-one percent of the captures were white-footed deer mice. Two species not captured in the pitfalls were captured in the snap traps: the water shrew and the Columbian ground squirrel (*Spermophilus columbianus*) (Table 32).

Table 32. Relative abundance (n/100 trap nights) of small mammals captured at 7 snap trap sites at Craig Mountain, Idaho, Spring 1994.

SITE[1]	TRAP NIGHTS	SPECIES						
		CLGA	MILO	MIMO	PEMA	SOPA	SPCO	All species
BMS	100	7	0	0	4	0	0	11
BM	36	0	0	0	1	0	1	
BMN	100	8	2	0	6	0	0	16
EC1	40	0	7.50	0	5.00	0	0	12.50
EC2	32	0	4	0	21.88.	9.38	0	43.75
EC3	32	0	1	0	46.90	0	0	50.00
EC4	52	0	0	0	30.80	0	0	30.77
WR	160	0	4	4.38	29.38	0	0	36.25
TOTAL	552							
AVERAGE		2.91	2.71	1.36	18.80	0.58	1	25.78

Discussion

The grassland (including yellow starthistle) and shrub/riparian habitats at Craig Mountain contain relatively high densities of small mammals. Voles were the most common small mammal captured, although white-footed deer mice were the most commonly trapped species in snap traps at Craig Mountain, and their relative abundance in the small mammal community may have been underestimated by the pitfall traps (Bury and Corn 1987, Szaro et al. 1988, McComb et al. 1991). Deer mice are clearly the dominant species in the yellow starthistle vegetation type. The wet meadow habitats supported relatively fewer small mammals, although trapping success may have been affected by colder temperatures, including freezing, at these higher elevations sites during the trapping periods. Columbian ground squirrels are also a common rodent in wet meadows, but were not adequately sampled by the methods used in this study.

[1] BMS=Forest south of Benton Meadows, BM=Benton Meadows, BMN=Forest north of Benton Meadows, EC1-4=Upper Eagle Creek, WR=Wapshilla Ridge.

[2] CLGA=Clethrionomys gapperi, MILO=Microtus longicaudus, MIMO=Microtus montanus, PEMA=Peromyscus iculatus, SOPA=Sorex palustris, SPCO=Spermophilus columbianus (three unidentified vole sp. from BMN were not included in this table).

More animals and more species were trapped in the spring than in the fall. The significant increase in numbers in the spring sampling was probably due to the presence of juvenile animals and perhaps to overall increased movements. May capture rates of montane voles can be 1.5 to 2.5x greater than those in September and October (Drabek 1994). Montane vole populations in eastern Washington also can exhibit regular cycles in population size (Randall and Johnson 1979).

Although more species were trapped in the spring than in the fall, the increases in number of species trapped over time suggested that all species present may not have been captured. Bury and Corn (1987) found that a 60day trapping period was necessary to trap 90% of the small mammal species in an area. Trapping periods in this study were approximately 30 days in the fall and 22 days in the spring. Additional species that might occur on Craig Mountain in low numbers that were not found in this study include the western harvest mouse (*Reithrodontomys megalotis*) and the heather vole (*Phenacomys intermedius*).

The most common small mammal species on Craig Mountain are generalists. Several species, including the white-footed deer mouse, which was most common in yellow starthistle, and the vagrant shrew and long-tailed vole, which were most common in alder riparian areas, are known to increase in response to livestock grazing and other disturbances (Larrison and Johnson 1973, Smolen and Keller 1987, Corn et al. 1988). Less common small mammal species were either more closely tied to specific habitats, were not trapped in their primary habitat, or were at the edge of their geographic range. Small mammal species on Craig Mountain that can be considered relative specialists to arid grass and shrub lands include the Great Basin pocket mouse, and Merriam's shrew. The Great Basin pocket mouse occurs primarily in association with sagebrush, grassland, and desert habitats from the Great Basin north to south-central British Columbia. They can be quite abundant, and in some areas are the most common species in the small mammal community. Craig Mountain is on the eastern edge of the range of the pocket mouse (Verts and Kirkland 1988). In addition, some other species of pocket mice are less susceptible to pitfall traps (Szaro et al. 1988), so they may be more common than suggested by the data collected in this project. Lack of capture of pocket mice at the low elevation yellow starthistle sites may be due to their lower susceptibility to pitfall trapping.

Merriam's shrew is also associated with arid sagebrush and grasslands, as well as open woodlands, and occurs in most states in the western U.S. It occupies the driest habiats of any shrew of the genus *Sorex* (Armstrong and Jones 1971). Merriam's shrews were found in sagebrush (*Artemesia*)-bluebunch wheatgrass and rabbitbrush (*Chrysothamnus*)-bluebunch wheatgrass communities in eastern Washington (Hudson and Bacon 1977). They' do not 'appear to be common anywhere in Idaho.

Merriam's shrew populations may increase in the absence of cattle grazing. In some areas, Great Basin pocket mouse numbers have been found to increase in grazed areas, (Medin and Clary 1989), whereas in others they have decreased (Larrison and Johnson 1973).

Western jumping mice are generally found in grassland riparian areas, as well as open, mesic forests. The abundance of jumping mice in the yellow starthistle sites may be due to an edge effect from the riparian areas. Jumping mice were only present in 2 of 3

yellow starthistle sites. Vegetation information collected at the sites may help in explaining the abundance patterns of this species. Western jumping mice are probably not affected by cattle grazing (Medin and Clary 1989).

The water shrew is closely tied to hydric habitats, typically found along edges of swiftly-flowing streams with rocks, logs, crevices, and overhanging streambanks. They are also found in marshes and along slow moving streams (Beneski and Stinson 1987). This species is a specialist limited to areas near water with abundant invertebrate populations.

Species that are probably common on Craig Mountain, but were not trapped in their primary habitats were the forest species, including the red-backed vole, the masked shrew, and the northern pocket gopher. The red-backed vole has been suggested as an indicator of older forest conditions, because of its association with coarse woody debris (Nordyke and Buskirk 1988). However, numbers also appear to increase immediately after logging, possibly in response to increases in slash and forage (seeds, mosses, lichens, and fungi) on the forest floor (Corn et al. 1988, Nordyke and Buskirk 1988, Raphael 1988, Shepherd 1994). Snap trap data supports the premise that red-backed voles appeared to be fairly common in the forest on Craig Mountain. Trapping in forest habitats could provide better data on small mammal communities in this vegetation type. Additional species including the pygmy shrew (*Microsorex hoyi*) and the northern flying squirrel (*Glaucomys sabrinus*), Idaho state species of special concern, may also occur in forest habitats.

Conclusions

Small mammal trapping at Craig Mountain provided baseline information on the grassland and riparian areas that suggested relatively high numbers of rodents and shrews, particularly in the riparian areas. The most abundant species were habitat generalists. Several more specialized species ocurred in the Idaho fescue grasslands, including the Great Basin pocket mouse and Merriam's shrew. These species may be the most sensitive to vegetative changes in these habitats.

Future inventory should be conducted in the grand fir/mixed conifer forest, when more habitat data are available for this vegetation type. The red-backed vole and masked shrew may be species that are sensitive to changes in mesic, older, forest, particularly relative to amounts of woody debris. In addition, 2 Idaho small mammal state species of special concern may occur in these habitats. Trapping should occur in the spring (April-June) and should continue for several months to adequately sample all species. Future inventory and monitoring could include addition of live traps, to sample a greater proportion of the species.

Two of the starthistle sites (YS1 and YS2) are release sites for biological controls. Additional starthistle sites in areas that are not being treated, and/or sites treated with alternative methods could be added to this study. Additional sites located farther from 'riparian areas could also be sampled to avoid possible edge effects observed in this study.

WILDLIFE MANAGEMENT ISSUES

The Craig Mountain Wildlife Mitigation Area was purchased to mitigate for wildlife habitat lost by the construction of Dworshak Reservoir. Mitigation for habitat, rather than for losses of individual animals, suggests that management be conducted in an ecosystem-based framework, rather than for selected species. This does not preclude management for individual species, but emphasizes conservation of habitats and wildlife associated with these habitats. In addition, managing from an ecosystem approach includes the recognition that in any ecosystem, wildlife species composition and numbers fluctuate through time as environmental processes change vegetative and wildlife communities. These processes include, but are not limited to fire, weather conditions, competition, predation, and parasitism.

Function of these natural processes and in fact much of the ecosystem at Craig Mountain has been altered over time by humans. Humans have reduced the level of natural disturbances, particularly fire, with which the system evolved, and increased the levels of human-caused disturbance, principally habitat modification by logging and livestock grazing. Additional human activities have included legal and illegal harvest of wildlife and the introduction of exotic animal, plant, and insect species. The result is that the wildlife community at Craig Mountain is different than it was historically, and different than it ever would have been if nature had taken its course in the absence of human-caused disturbance. Ubiquitous species such as robins, long-toed salamanders, and deer mice have probably become more abundant, whereas more specialized species such as brown creepers, tailed frogs, and Merriam's shrew have probably decreased (Table 33). Several bird species which only breed in the western U.S., and are perhaps the closest to being considered northwest endemics: white-headed woodpecker, and Townsend's warbler (Paulson 1992) have probably declined. Some native species, such as marten, sharp-tailed grouse, and white-tailed jackrabbits have been, or may have been extirpated. Other species such as brown-headed cowbirds have expanded their range, and now occur in an area where they were previously absent (Rothstein 1994). In addition, numerous introduced wildlife species such as wild turkey, chukar, gray partridge, european starlings, and brook trout have become well-established.

Craig Mountain provides valuable habitat for wildlife in its current condition. Because of topography and location, the area supports a diversity of vegetation types and animal species. However, management actions to date have not been aimed at conserving this diversity, but instead have been directed at providing economic gain and have favored adaptable generalist species. If the desired future condition is to provide a sustainable system for all wildlife in a costeffective manner, then efforts should be made to reduce the effects of human-caused disturbance (primarily grazing, logging, and introductions of exotic species), restore habitats where feasible, and to increase the natural disturbance (primarily fire) which historically has been instrumental in creating and maintaining this system. This would help in reducing future loss of wildlife biodiversity due to maintenance or increases of current disturbed habitat conditions and the associated wildlife community relationships resulting from these conditions. Restoring more natural processes would specifically provide long term benefits to target mitigation species (pileated woodpeckers, yellow warblers, and

Table 33. Hypothesized changes iu abundance of selected native wildlife species due to human activities at Craig Mountain (from information in Larrison and Johuson 1973, Smolen **aud Keller 1987, Corn et al. 1988, Bock et al. 1993, Hejl et al. in press and data on species-habitat relationships).**

Potential increasers	Potential decreasers
White-footed deer mouse	Beaver
Vagrant shrew	Merriam'sshrew
Long-tailed vole	Mountain quail
Barred owl	Northern goshawk
American kestrel	Pygmy nuthatch
Red-tailed hawk	White-headed woodpecker
Brown-headed cowbird	Yellow-rumped warbler
House wren	Townsend's warbler
American robin	Northern oriole
Calliope hummingbird	Brown creeper
American crow	winter wren
Long-toed salamander	Tailed frog

black-capped chickadees) and their habitats.

Some examples of the types of habitat changes that have occurred at Craig Mountain, and the implications from a wildlife perspective follow. Expanded discussions of habitat conditions are included in Mancuso and Moselely (1994).

Aquatic areas at Craig Mountain have been altered by past logging, roading, and livestock grazing. These activities generally result in destabilization of streambanks, increased sedimentation and filling in of interstitial spaces, increased seasonal water temperature variation, and reduced subsurface storage of water with a reduction or elimination of summer streamflows (Elmore and Beschta 1987). This reduces habitat available for fish and aquatic invertebrates (Rabe 1994) and consequently those species that depend on them. Livestock grazing also reduces the amount of streamside vegetation and simplifies the riparian vegetative structure (Boone et al. 1983) which reduces wildlife abundance and species diversity by favoring widespread generalist species over riparian specialists (Dobkin 1994).

In the grasslands at Craig Mountain, cover of perennial grasses, mosses, and litter has been reduced and introduced and invasive grasses and forbs have increased due to livestock grazing. This has benefitted species that prefer 'short grass and bare ground, or feed on

annual grasses or forbs, and negatively impacted species that rely on native bunchgrasses or litter. For example, cattle grazing in bunchgrass communities may benefit omnivorous and granivorous small mammal species (Grant et al. 1982), but may negatively affect ground-nesting birds that require vegetative cover. Although grasslands provide primary habitat for fewer wildlife species (only 5% of native bird species) than other more complex habitats such as forests and riparian areas, conservation of grasslands has become a wildlife concern on a national scale. In the western U.S., undisturbed grassland ecosystems are extremely rare, and those wildlife species that are not unaffected or benefitted by agriculture or livestock grazing are facing significant population declines (Knopf 1994).

Many forest stands at Craig Mountain were historically maintained in seral states by wildfire. Forest communities at Craig Mountain can be categorized into 2 different fire regimes. Warm, dry to moderate Douglas-fir, grand fir, and ponderosa pine types (fire group 2) are most prevalent in the canyon forests, but also occur as pockets in upland forests. *Mean* nonlethal fire intervals in this fire group range from 23 - 50 years, lethal tire intends range from 50 - 138 years (Smith 1994). Historically, wildfire maintained many of these drier forest types in seral stages dominated by ponderosa pine. These stands contained low densities of large fire-resistant pines and an open understory (Mutch et al. 1993). These open stands of large ponderosa pine trees are declining regionally because of logging practices and fire suppression. The stands once dominated by disease resistant pines have been invaded by more pathogen-susceptible fir species (Castello et al. 1995). Bird species diversity and mule deer and elk use may increase in forests affected by pathogens such as mistletoe (*Arceuthobium spp.)* (Bennetts *et al.* 1991, Mlot 1991). Bird species diversity is also probably higher in multi-storied mixed conifer forests than in open ponderosa pine stands (MacArthur and MacArthur 1961). However, some wildlife species are adapted to seral "old growth" ponderosa pinedominated systems (for example: pygmy nuthatches, flammulated owls, and white-headed woodpeckers, all Idaho state species of special concern). The wildlife species associated with this system are currently rare on Craig Mountain and are probably declining range-wide as a result of the decreasing availability of these habitats.

-Moderate to moist grand fir habitat types (fire group 7) are more typical of upland forest community types at Craig Mountain. Mean nonlethal fire intervals range from 45 - 100 years, and lethal fire intervals from 116 - 185 years (Smith 1994). In most areas on Craig Mountain, these forests have been "high-graded", with most of the larger, valuable trees removed. Regeneration has likely been slowed by cattle grazing. Management of forested habitats at Craig Mountain on a stand-by-stand basis also appears to have created a fragmented pattern of different-aged patches. Historically, stand sixes may have been larger, with a smaller percentage of less abrupt edge between different-aged forest and between forested and open areas. Recent management appears to have favored edge-associated wildlife species over those that require interior or continuous forest.

Wildlife community relationships

Human-caused changes in habitats have resulted in corresponding changes in the balance of wildlife communities at Craig Mountain. These changes have affected the

relationships among species including parasitism, predator-prey associations, and competition. For example, increases in numbers of some small mammals caused by livestock grazing may increase populations of predators such as coyotes and red-tailed hawks. Creation of abrupt forest edge through logging may be beneficial to avian predators, particularly corvids (Wilcove 1985, Ratti and Reese 1988, Yahner et al. 1989) which in turn has a negative effect on other open-nesting birds. Creation, of edge and open forest through logging, along with the introduction of livestock grazing, and human development have also created habitat conditions on Craig Mountain (and throughout the west) that have enabled range expansion of brown-headed cowbirds (Vemer and Ritter 1983, Rothstein 1994). As their name suggests, brown-headed cowbirds usually feed near livestock although campgrounds and bird feeders are also preferred feeding sites (Vemer and Ritter 1983, Rothstein 1994). Brown-headed cowbirds parasitize nests of other birds, often shrub-nesting songbirds such as warblers, vireos, and buntings, causing reduced survival of the host species' offspring. Many bird species in the western U.S. did not evolve with cowbirds because historically cowbirds appear to have been restricted to the range of bison in the Great Plains. The relatively recent combination of habitat alteration and parasitism has reduced productivity of some avian species to the point that there is concern for their survival (Rothstein 1994). Local extinctions of heavily parasitized species may have already occurred (Greene 1994).

Introduction of exotic wildlife has also likely affected the composition and balance of the native wildlife community. For example, european starlings often outcompete native cavity-nesting birds such as bluebirds and flickers (Feare 1984). Although they are not common on Craig Mountain, starlings appear to have colonized the area in response to human developments, and are most prevalent around abandoned buildings. Spotted frogs (a C2 candidate species) have been nearly eliminated in western Washington due to the combined effects of habitat modification and predation by introduced bullfrogs and fish species, particularly centrarchids (bass, crappie, etc.) (McAllister et al. 1993). Bullfrogs and centrarchids (bass) are also present along the river corridors at Craig Mountain where no , spotted frogs were observed. Spotted frogs are fairly common in ponds and wetlands on the upper plateau where neither bullfrogs nor fish are present, but were absent from Soldiers Meadows Reservoir where fish are present. .

Recommendations

Previous management activities at Craig Mountain have favored those wildlife species that are accommodated by human-caused disturbances. It is likely that selection for these species will continue at Craig Mountain on many of the lands surrounding the mitigation area. The overall recommendation from an ecosystem perspective is to balance management between generalist, adaptable species and specialists by reducing human-caused disturbance patterns and restoring, incorporating, and/Or imitating natural processes to the greatest extent possible.

1. Eliminate or minimize livestock grazing, at least in the short term. Livestock grazing has impacted nearly every habitat at Craig Mountain, from hindering reforestation of upland areas, to increasing the spread of noxious weeds in grasslands, to destabilizing streambanks, impairing hydrologic function, and reducing shrub understory in riparian areas. Livestock grazing has probably also directly impacted bird populations by increasing brown-headed cowbird parasitism. Livestock grazing does not mimic or replace any naturally occurring process in the Craig Mountain ecosystem. If grazing is instituted to meet a specific wildlife goal, timing, duration, and extent should be carefully designed, managed, and monitored to avoid impacts on other wildlife species and habitats.

2. Develop a plan to restore wildfire to the greatest extent possible given' current habitat, land use, and social conditions. Historically, fire was a driving force in the Craig Mountain ecosystem and has been an evolutionary factor in the relationships of many of the plant and animal species.

3. Develop a plan to restore/maintain all forest seral stages (including mature and old growth forest), reduce habitat fragmentation, and provide linkages among older forest habitat patches, taking into account the entire Craig Mountain area. In selected forested areas where restoration of wildfire is not feasible, experiment with logging and/or prescribed tire to recreate functional conditions historically produced by wildfire. Include retention of snags and riparian and watershed protection in areas treated by logging and assess wildlife and vegetative response to these treatments in order to implement adaptive management. Implementation of prescribed fire outside the natural fire season (e.g. in spring) should be evaluated for potential impacts on wildlife. Carefully evaluate any salvage-logging in burned areas unless these habitats are not limiting in the surrounding environment. Replant areas if necessary where natural regeneration is not occurring.

4. Reestablish upland riparian areas as functioning systems through restoration of stream channels, planting of native and if necessary, short-lived nonnative plant species, and reintroduction of beaver (which currently appear to be limited to the Salmon and Snake River corridors) when and where appropriate.

5. Avoid introductions of additional nonendemic or exotic wildlife species. If any such species are proposed for introduction carefully consider all possible conflicts with native species.

6. Management of rare or declining wildlife species, such as special status species should be considered high priority. These species and/or their habitats are uncommon or declining statewide and/or regionally and they are unlikely to be managed for on most surrounding lands.

7. Provide for public use to the greatest extent possible without compromising wildlife mitigationrequirements. Manage recreational use to avoid conflicts with wildlife and educate and include members of the public in understanding and meeting management goals.

WILDLIFE MONITORING

Introduction

The Dworshak Mitigation Agreement (BPA et al. 1992) directs the IDFG and the NPT to identify mitigation activities and to develop monitoring plans to evaluate the results of these activities. These data will also prove useful for prioritizing and evaluating management and will provide opportunities to capitalize on successes and avoid repeating failures through adaptive management (Holling 1978).

The p&posed wildlife monitoring program at Craig Mountain for species other than deer and elk addresses:

1. Target species.
2. Rare animals: threatened, endangered; candidate, and species of special concern.
3. Other wildlife: including black bear, carnivores, upland game birds, and small mammals.

Objectives

This monitoring strategy incorporates ongoing baseline measurement of wildlife abundance and trend, and assessment of responses to management activities. There are 2 primary goals of the strategy:

1. To evaluate the success of specific mitigation activities at Craig Mountain.
2. To contribute to assessments of the status of wildlife populations at a larger scale, for example game unit, regional, and state levels.

The wildlife monitoring program is designed to provide population, trend, and distribution data through observational and quantitative monitoring. Observational monitoring includes photo plots, incidental wildlife observations, and wildlife surveys for presence such as track transects, species lists, and calling surveys. The advantages of this type of monitoring are that it is relatively inexpensive and rapid. These type of data can illustrate possible changes, for instance in the appearance of vegetative communities, or suggest changes in wildlife distribution. The disadvantages are that changes often have to be dramatic in order to be detected, no statistics can be used to evaluate changes in abundance, and the results are often open to interpretation because of lack of quantitative information and variable levels of survey effort. The observational monitoring recommended in this report can be included in regular operations and/or be done at relatively low cost using volunteers, students, interns, or bioaides.

Quantitative monitoring includes measurement of vegetation plots, wildlife counts,

trend monitoring, and any other sampling that can be analyzed statistically. The advantages of this type of monitoring are that, if designed well, it is more accurate, precise, and less biased than observational techniques. Quantitative monitoring can test scientific hypotheses, trends can be detected before changes become obvious, and the results are less ambiguous. The disadvantages to quantitative monitoring are that it can be expensive and time consuming. However, while observational monitoring can provide some interesting and valuable information, only quantitative monitoring can critically evaluate the success of wildlife management on Craig Mountain. The bulk of any financial commitment to monitoring at Craig Mountain should be concentrated on quantitative monitoring.

Of primary importance in designing a quantitative monitoring program is to weigh the costs vs. benefits of obtaining sufficient sample sizes in order to detect potential differences in abundance. Statistical tests control for Type I error (α) - the probability of rejecting a null hypothesis that is true (or detecting a change when none is present), usually restricting this error to less than 5%. Statistical tests do not control for Type II error (β) - the probability of not rejecting a hypothesis that is false (or detecting a change when one is actually present). This is controlled by the Type I error rate selected, the variability in the population, and the sample size. When variability is high and sample sizes are low,. it becomes very difficult to statistically detect any differences in population estimates. Therefore, it is important to have an idea of the kind of effort that will be necessary for a quantitative monitoring effort to be successful. If this level of effort is not going to be feasible then a different approach should be considered.

As an example, in a recent breeding bird monitoring project, surveys were conducted over 2 years at 14 points: 8 control survey points and 6 treatment survey points in areas that had been logged (Harris 1993, 1994). Both controls and treatments were stratified into 2 forest habitat types. The projectillustrates some of the problems associated with monitoring: (1) no baseline data were collected before the treatment (logging) was implemented, (2) there was significant variability between years in both treatment and control areas (3) abundance of the measurement variable was low (only 6 bird species occurred at mean abundances greater than or equal to 1), and (4) sample sizes were small. For these reasons, only differences of greater than 100% could be detected statistically and the data interpretation was limited to commonly occurring species. Not surprisingly, few significant differences have been observed among the numbers of birds in treatment and control areas. While some of these conditions are unavoidable, any plan to quantitatively monitor wildlife population responses to management at Craig Mountain should seek to address, and where possible avoid, these problems in the most efficient manner. A monitoring design should include: baseline information, controls, replication, adequate sample size, and be implemented at the appropriate scale. Monitoring projects should be analyzed and reevaluated regularly to determine whether they are adequate and appropriate.

Proposed monitoring activities

This wildlife monitoring strategy proposes that baseline monitoring of target species and associated communities, rare species, and other wildlife be conducted on a regular basis

as an ongoing part of regional or project activities. Additional personnel may be necessary for some monitoring efforts. In addition to baseline monitoring, major habitat improvement or demonstration projects should include monitoring as part of the cost of the project to provide an evaluation of the project success. This monitoring would involve the target mitigation bird species, rare animals, or other species which are expected to benefit from the management action (Table 34).

Four baseline monitoring activities are proposed as high priority: recording incidental observations of species of special interest and entering them into a database, quantitative surveys of target bird species (surveys include other songbirds and upland game birds), black bear trend surveys, and surveys of selected wetland, pond, and stream amphibian breeding habitats. All of these would be conducted in a manner that would not only provide information pertaining to Craig Mountain, but could also be incorporated in broader scale assessments of status and/or trend. Quantitative monitoring that addresses both local and regional populations could be funded and/or conducted cooperatively with adjacent or inholding land management agencies, such as BLM or NPT, universities, or other organizations.

Additional monitoring projects are included as lower priority, but these would be beneficial, particularly if they can be accomplished without impacting other monitoring or project duties. Incorporating monitoring into land management activites is also recommended including collecting pre-project baseline information and setting up controls, monitoring project implementation, and monitoring habitat and wildlife response. This mointoring would concentrate on target species, rare species, and/or other animals the management activity is intended to benefit.

Other monitoring or additional inventory efforts may be identified in the future, and these or other projects may become higher priority as management issues and needs change.

Methods

Incidental observations

A database started during the inventory phase should be maintained for wildlife observations and reports by the public and all personnel working on the area. Observations of all rare animals, any animals previously unreported on the area, and any animals of special interest should be collected using a standardized data sheet (Appendii D) and entered into the Craig Mountain incidental observation database. Copies of rare animal reports should also be sent to the Idaho Conservation Data Center in Boise. Incidental observations collected in this database should be summarized on an annual basis.

Table 33. Proposed wildlife monitoring at Craig Mountain.

Activity	Priority	Personnel required	Season
BASELINE MONITORING			
Incidental observations	1	Project personnel	Yearround
Target bird species	1	Skilled birders/regional and project personnel	mid March -June
Black bear	1	Regional/project personnel	June
Amphibians	1	Regional/project personnel, possible university project	April - July
Small mammals	2	Project personnel/university professor/students	April-May
Chukars	2	Skilled birders/regional and project personnel	May - June or August
Peregrine falcon/raptor	2	Regional/project personnel	mid-March - early April or late May - early June
Bald eagle	2	Regional/project personnel	December - January
River otter	2	Regional/project personnel	October
MANAGEMENT MONITORING			
Target bird species	1	Skilled birders/project personnel	mid March - June
Rare animals	1	Technician or biologist	May - July
Wildlife species list	2	Community group/university	Yearround

Target bird species: pileated woodpecker, yellow warbler, and black-capped chickadee

The 3 target bird species were chosen as representatives or indicators of mature conifer forest, riparian shrub, and deciduous riparian habitats lost as a result of the construction of Dworshak Reservoir, rather than for special interest in these particular species. Suitability models (Schroeder 1983a, b, c) were used to evaluate habitat quality for

each of these species and determine losses. These species will continue to be used as habitat indicators and for assessment of mitigation benefits. In addition, monitoring of these species is designed to gather information on other birds that use the same habitats and will enable examination of community-level changes.

Permanently-marked survey points for monitoring pileated woodpeckers, black-capped chickadees, and yellow warbler target species as well as other nesting birds have been established in forest, grassland, and riparian areas. Surveys at these points provide baseline quantitative estimates of relative and absolute abundance of target bird species. Coefficient of variation of estimates of birds/point obtained during the inventory period ranged from 15 - 38% for pileated woodpeckers and from 13 - 36% for yellow warblers. Density estimates were more variable, ranging from 49 - 76% for pileated woodpeckers and 38 - 64% for yellow warblers. Stratification of points by vegetation type before analysis should help reduce this variability, particularly for pileated woodpecker counts. This stratification should be included as part of the survey effort.

Surveys for target bird species should be conducted by skilled or trained observers with good hearing, ideally by the same individuals every year. Underqualified observers record consistently lower bird species totals and the results of surveys done by underqualified observers are not comparable from one year to the next (Faanes and Bystrak 1981). Even when done by qualified observers, there is some effect of observer on the number of birds and the number species observed (Sauer et al. 1994), however there is less variability among years (Faanes and Bystrak 1981). In addition, the surveys will be more efficient if they are consistently done by the same observers, because less time will be spent in reconnaissance looking for transects and survey points;

Pileated woodpeckers

Survey sites

Fourteen transects (134 points) were established to monitor pileated woodpecker numbers. The points are surveyed using a variable circular plot methodology and a 5 minute count period. These transects are distributed across the mitigation area. Monitoring could be accomplished with a modified rotational sampling design with replacement (Skalski 1990). The advantage of this design is that both population estimates and trend can be obtained. Four transects would be monitored every year, and each year 2 additional transects would be rotated. This would result in all transects being run every 5 years. Each transect would be run 3 times over a 'I-week period. It would require 2 people 10 - 15 days each year to run the transects. This includes time for practice, locating transects, bad weather and data entry. These transects will measure all woodpeckers and other early-nesting resident birds including chickadees, nuthatches, ruffed grouse, and wild turkeys. Few neotropical migratory forest birds will be counted in these surveys.

Protocol

Sampling period - 15 March - 10 May. Each transect should be surveyed once in each of the following periods: 15 March - 2 April, 3 April - 21 April, and 22 April - 10 May.
Starting time - sunrise (approx. 0600)
Ending time - 1000

Surveys should be conducted during fair weather or very light rain or snow when wind speeds are less than 15 mph. Upon arrival at each station, the surveyor waits for 3 minutes. After this period, the observer begins a 5-minute survey period. During this time the species, the distance away, and the type of detection (visual or aural) should be recorded for all birds seen or heard. The Craig Mountain breeding bird survey form (Appendix D) should be fully completed. The initial starting point for each transect is selected randomly, and then alternated each time it is run. All transects should be run (in random order) before repeating surveys.

Survey equipment required - Vehicle, binoculars, clipboard, breeding bird survey form (Appendix D), field guide, and bird song tapes. A data recorder could also be used to enter data directly in the field.

No vegetation monitoring strategy has been developed for forested habitats, although some data were collected at selected sites (Mancuso and Moseley 1994, Narolski, unpubl. data). It will be especially important to sample forest vegetation if forest management activities are conducted that are designed to improve wildlife habitat.

Analysis

Data'should be analyzed as no. birds/point and as density using the ordered-distance method of density calculation (Roeder et al. 1987, Garton and Leban 1993). Points should be stratified by vegetation class as a combination of cover type and successional stage prior to analysis. An annual report should be submitted of the data collected including a comparison with previous years data.

Yellow warblers and black-capped chickadees

Transects for yellow warblers and black-capped chickadees wereestablished along Eagle, China, and Wapshilla Creek riparian areas. Surveys of China Creek and Wapshilla Creeks could be alternated annually with surveys of Eagle Creek. This would involve running 4 transects each year, 3 times during the breeding season and would take 2 people about 7 days over a 7-week period, including a few days for set up, practice, and bad weather. These transects will measure riparian bird species including neotropical migrants and wild turkeys.

Protocol

Sampling period - 11 May - 29 June. Transects should be surveyed once during at least 3 of the following periods: 11 May - 20 May, 21 May - 30 May, 31 May - 9 June, 15 June - 19 June, 20 June - 29 June.
Time of surveys - 0500 - 0900

Surveys should be conducted during fair weather when wind speeds are less than 15 mph. Upon arrival at each station, the surveyor should wait for 3 minutes. After this period, the observer should begin a N-minute survey period. During this time the species, the distance away, and the type of detection (visual or aural) should be recorded. The initial starting point for each transect is selected randomly, and then alternated each time it is run. All transects should be run (in random order) before repeating surveys.

Survey equipment - vehicle, binoculars, clipboard, breeding bird survey form (Appendix D), field guide and bird song tapes. A data recorder could also be used to enter data directly in the field.

Vegetation plots were established at 17 riparian bird points and sampling is recommended once every 5 years (Mancuso and Moseley 1994). It is important to maintain this schedule in order to compare vegetation and wildlife changes. Vegetation monitoring includes assessment of habitat unit trend through measurement of HSI model parameters.

Analysis

Data should be analyzed using the ordered-distance method of density calculation (Roeder et al. 1987) stratifying points by elevation and vegetation type prior to analysis. Data should be reported as no. birds/point and densities by elevation and vegetation type and an annual report should contain all data collected and comparisons with previous years.

Bear scent stations

Little information is available on black bear or carnivore populations at Craig Mountain. Information collected during the inventory period indicated that Craig Mountain supports a low density bear population. To document population trend, 10 trend survey routes established in the inventory period should be monitored annually. Two sardine cans are hung together from a tree every mile for 5 miles along each transect during June. Cans are picked up and checked for bear activity 5 days after they are put out. Surveys are coordinated region-wide. Maps and protocol are available in the regional office wildlife files.

A drawback of this methodology to date at Craig Mountain has been the low number of visits to the scent stations. Since the visitation rate was only 2 - 4% each year (1 or 2 visits out of 50 stations), a downward trend in the population would probably not be noticed

and even an upward trend might be difficult to detect. Areas where this technique has been successful at detecting changes in black bear populations in Idaho have typically had average visitation rates between 20 and 30% (Beecham and Rohlman 1994). A low response variable and high natural variability increase the possibility of a Type II error and reduce the power of this technique to detect actual changes in the population. Use of bait stations trend surveys is being reevaluated in several areas of the state. The Craig Mountain bear trend surveys should be reassessed after 5 years (or before if changes are made statewide) to determine whether the monitoring objective can be met with this technique or whether the effort may be better spent in other areas.

Amphibians

Three amphibian species occurring on Craig Mountain are candidates for listing as threatened or endangered and/or state species of special concern. Spotted frogs are a category 2 candidate for threatened or endangered listing and a state species of special concern, tailed frogs are a category 2 candidate for threatened or endangered listing, and western toads are a state species of special concern. Amphibians are also considered sensitive bioindicators of environmental change because of their highly permeable skin, multiple trophic positions, and occurrence in fragmented but interconnected populations and there are global concerns about declining amphibian populations (Blaustein and Wake 1995).

In order to monitor amphibian populations at Craig Mountain, selected aquatic and wetland areas in the upper plateau, along upper elevation stream reaches, and along the Snake and Salmon River corridors should be monitored annually for breeding activity of spotted frogs, tailed frogs, western toads, and other amphibians. This is a quick survey primarily for presence and requires the ability to recognize species at the egg, larval, and adult stages. The surveys can be conducted during the course of other duties in the area. This might also be a good project for a university to participate in and possibly take over after initial set up. Sites will be established in 1995, and surveys should follow a protocol being developed by Idaho State University.

Potential survey sites

Upper Plateau:	Benton Meadows Stock Pond and associated wetlands, Roberts Spring Fire Pond, East Fork Deer Creek (Section 27) Stock Pond, Larrabee Meadows Reservoir and wetlands and Frye Point Springs.
streams:	Upper Eagle Creek, Upper S. Fork Captain John Creek
River corridor:	Salmon River, 4 locations between China and Eagle Creeks; Snake River, 6 locations near Limekiln and Chimney Creeks.

Sites should be described and mapped so that identical sites are being monitoredeach year.

Proposed survey period

Upper Plateau	1 April - 15 June
Streams	1 July - 31 July
River Corridor	15 June - 15 July

small mammals

Pitfall trapping at the 15 sites measured during the inventory period would provide quantitative measurement of small mammal species relative abundance through time. Small mammal communities could be monitored in several vegetation types not covered in the proposed monitoring plan for target wildlife species, including wet meadows, yellow starthistle, and grasslands. Pitfall trapping should be conducted in late April - May, to be comparable to data collected during the inventory period and run through June to adequately sample all species (Bury and Corn 1987). Depending on availability of time it may be necessary to choose 1 or 2 vegetation types to monitor annually, perhaps as a university project. Three replicate sites should be monitored for each vegetetation type. This is the minimum number **necessary** in order to **statistically** draw any conclusions. If a site is lost due to a land trade and monitoring of the area is no longer practical, a new site could be established, or the vegetation type should not be monitored. One method would be to cycle through all sites at 3-year intervals; running at least **1/3** of the traps, every year. If the objective is to track changes within a vegetation type over time, all 3 replicates can be run in the same year. If the objective is to compare relative abundance between replicates, (e.g. starthistle vs. no starthistle areas) then traps in all vegetation types to be compared should be run in the same year, or one replicate in each vegetation type could be run each year. Although this is not the most simple method logistically, it will help account for differences in trapping rates caused by weather. Capture rates **appeared** to be highly weather dependent in 1993 and 1994 and concurrent collection of temperature and precipitation data, for instance with a **data** logger, is recommended for any small mammal monitoring effort.

Live trapping using mark-recapture techniques could provide actual estimates of population density. Larger live traps would also target additional rodents such as ground and tree squirrels. Live and pitfall trapping results would not be comparable, but could be designed to complement eachother.

Chukars

Late summer helicopter **surveys** for chukars are currently conducted annually along 2 transects near Craig Mountain: along the Salmon River from Whitebird Creek to Maloney Creek and along the Snake River from Hellsgate State Park to Corral Creek. An additional transect could be established from Maloney Creek to Corral Creek to cover the Craig Mountain Mitigation Area.

Chukars were also surveyed at grassland breeding bird **survey** points during the

inventory period. Monitoring of spring chukar numbers could be accomplished by continuing annual or biannual monitoring at these points and obtaining quantitative information on the number of birds/point as well as estimated density, similar to surveys proposed for target bird species monitoring. Other grassland bird species would also be monitored in these surveys.

Raptors

Raptor surveys of the lower Salmon River and a portion of the Snake River have been conducted over the past 20 years by various agencies (Appendix B). Surveys conducted cooperatively by IDFG and BLM during the inventory period identified 21 monitoring points that could be revisited on a regular basis to quantify raptor relative abundance, and document nesting activity. If 1/3 of these points were surveyed annually, the points at Craig Mountain would be monitored every 3 years. Proposed survey schedule would be (1) Hammer Creek - Rice Creek, (2) Rice Creek - Eagle Creek, and (3) Eagle Creek - Heller Bar.

Surveys should be conducted mid-March to early April or late May to mid-June to avoid the incubation period. Each point should be surveyed for 2 hours by 2 or 3 people using scopes and binoculars. All birds observed should be recorded. A data sheet is included in Appendix B.

An April helicopter survey of the main river corridor and side canyons every 5 years would also be a beneficial and cost-effective way to search for peregrine falcon nesting activity and would contribute to raptor population monitoring.

Bald eagles

Wintering bald eagle surveys conducted along the river corridor in late December or early January either in conjuction with big game helicopter surveys or other fish or wildlife work being conducted by boat along the river corridor could be compared to data collected during the inventory period. Data should be recorded using the data sheet in Appendix and a copy provided to the Zone 3' winter bald eagle count coordintor (currently Craig Johnson, BLM Cottonwood). Unless incorporated into the regional midwinter bald eagle survey (generally conducted the second week of January), the information would have limited application, but it would provide an estimate of the minimum number of bald eagles wintering on the area.

Rlver otter

No quantitative river otter monitoring is possible without capturing and marking animals. Observational monitoring could be conducted by revisiting the points identified in the inventory and documenting presence of river otters or sign. This project would not provide any quantifiable information, but would provide documentation of river otter use.

Mitigation action monitoring

Where feasible, monitoring of management activites should include baseline information, implementation monitoring, habitat response monitoring, and wildlife response monitoring in order to provide feedback for adaptive management. Baseline information includes wildlife and habitat information already collected during the inventory period. In addition, for major management activities, such as livestock grazing or timber harvest, specific wildlife information on the target species and other species the project is designed to benefit, as well as potentially occurring rare plants and animals should be collected in the area where the proposed activity would be implemented. This information could be incorporated in the design of the project. Implementation monitoring addresses measurement of prescription components, for example snag and tree densities and dbh's, buffer strips, and water yields after timber harvest or bank stability and range condition after livestock graxing, for comparison with prescription requirements. Habitat response monitoring evaluates effects of the management on wildlife habitat such as snag retention, woody debris distribution, understory components, weed density and distribution, wildlife habitat units, revegetation rates, etc. Wildlife response monitoring would include surveys to quantitatively measure abundance and trend of wildlife in the treatment area. At the same time, ongoing baseline monitoring in untreated areas could serve as controls.

Additional observational monitoring could include establishing species lists for specific management projects. Project biologists and/or interested members of the public such as students or local birders could construct a wildlife species list at selected demonstration areas before the project is started and then monitor the area annually after it is completed. In addition, this monitoring could be repeated during different times of year to examine wildlife use seasonally. The objective of this monitoring would be to collect some observational data as well as involving and educating interested persons regarding habitat management efforts.

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Appendix A. **Preinventory** list of animal species potentially occurring at Craig Mountain, Idaho.

Amphibians and reptiles potentially **occuring** at Craig **Mountain,** Idaho.

	Common Name	Scientific Name
	Long-toed salamander	*Ambystoma macrodactylum*
	Tiger salamander	*Ambystoma tigrinum*
	Idaho giant salamander	*Dicamptodon aterrimus*
	Western toad	*Bufo boreas*
	Pacific tree **frog**	*Pseudacris regilla*
	Bullfrog	*Rana catesbeiana*
	Tailed frog	*Ascaphus truei*
	Northern **leopard** frog	*Rana pipiens*
*	Spotted frog	*Rana pretiosa*
	Great Basin spadefoot toad	*Spea intermontana*
	Painted turtle	*Chrisemys picta*
	Western fence lizard	*Sceloporus occidentalis*
*	Northern alligator lizard	*Elgaria coerulea*
	Short-homed lizard	*Phrynosoma douglassi*
	Sagebrush lizard	*Sceloporus graciosus*
	Western **skink**	*Eumeces skiltonianus*
	Rubber boa	*Charina bottae*
	Racer	*Coluber constrictor*
*	**Ringneck** snake	*Diadophis punctatus*
*	Night snake	*Hypsiglena torquata*
	Gopher snake	*Pituophis catenifer*
	Western terrestrial garter snake	*Thamnophis elegans*
	Common garter snake	*Thamnophis sirtalis*
	Western rattlesnake	*Crotalus viridis*

24 species
4 species with special designation

* **species with special designation**

Preinventory list of birds potentially **occurring** at Craig Mountain, Idaho.

	Common Name	Scientific name
	Great **Blue** Heron	*Ardea herodias*
	Canada Goose	*Branta canadensis*
	Mallard	*Anas platyrhynchos*
	American **wigeon**	*Anas* americana
	Northern **pintail**	*Anas acuta*
	Green-winged teal	*Anas crecca*
	Common goldeneye	*Bucephala clangula*
	Bufflehead	*Bucephala albeola*
	Common merganser	*Mergus merganser*
0	Turkey Vulture	*Cathartes aura*
O	Osprey	*Pandion haliaetus*
*	Bald Eagle	*Haliaeetus leucocephalus*
F	Northern Harrier	*Circus* cyaneus
F	Sharp-shinned hawk	*Accipiter striatus*
F	Cooper's Hawk	*Accipiter cooperii*
F*	Northern Goshawk	*Accipiter gentilis*
O*	Swainson's Hawk	*Buteo swainsoni*
F	Red-tailed Hawk	*Buteo jamaicensis*
F*	Ferruginous Hawk	*Buteo regalis* ,
	Rough-legged Hawk	*Buteo lagopus*
	Golden Eagle	*Aquila chrysaetos*
F	American Kestrel	*Falco sparverius*
F*	Merlin	*Falco columbarius*
O*	Peregrine Falcon	*Falco peregrinus*
F	Prairie Falcon	*Falco mexicanus*
	Gray Partridge	*Perdix perdix*
	Chukar	*Akctoris chukar*
	Ring-necked Pheasant	*Phasianus colchicus*
	Blue Grouse	*Dendrogapus obscurus*
	Ruffed Grouse	*Bonasa umbellus*
	Wild Turkey	*Meleagris gallopavo*
	California Quail	*Callipepla californica*
*	Mountain Quail	*Oreortyx pictus*
F	**Killdeer**	*Charadrius vociferus*
	Greater Yellowlegs	*Totanus melanoleucus*

• - species with special designation
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target species

Preinventory list of birds potentially occurring at Craig Mountain, **Idaho.**

	Common Name	**Scientific** name
	Spotted Sandpiper	***Actitus macularia***
	Common Snipe	***Gallinago gallinago***
	Ring-billed Gull	***Larus delawarensis***
	California Gull	***Larus californicus***
	Herring Gull	***Larus*** argentatus
	Rock Dove	***Columba livia***
F	Mourning Dove	***Zenaida macmum***
O*	Black-billed cuckoo	***Coccyzus erythropthalmus***
O*	Yellow-billed **cuckoo**	***Coccyzus americanus***
	Barn Owl	***Tyto*** alba
O*	Flammulated Owl	***Otus flammeolus***
	Western **Screech** Owl	***Otus*** kenniwtti
	Great-homed Owl	***Bubo virginianus***
*	Northern Pygmy-Owl	***Glaucidium*** gnoma
	Burrowing Owl	***Speotyto canicularia***
*	**Barred *Owl***	***Strix varia***
*	Great Gray Owl	***Strix nebulosa***
F	**Long-eared** Owl	***Asio otus***
F	Short-eared Owl	***Asio flammeus***
	Northern Saw-whet Owl	***Aegolius acadicus***
0	Common Nighthawk	***Chordeiles minor***
0	Common **Poorwill**	***Phalenoptilus nuttallii***
0	**Vaux's** Swift	***Chaetura vauxi***
0	Black **Swift**	***Cypseloides niger***
O	***white-throated swift***	***Aeronautes saxatilis***
0	Black-chinned Hummingbird	***Archilochus alexandri***
0	Calliope Hummingbird	***Stellula calliope***
0	Broad-tailed Hummingbird	***Selasophoms platycercus***
0	Rufous Hummingbird	***Selasphorus rufus***
F	Belted Kingfisher	***Ceryle alcyon***
0	Lewis' Woodpecker	***Melanerpes lewis***
0	Williamson's sapsucker	***Sphyrapicus thyroideus***
0	**Red-naped** Sapsucker	*Sphympicus **nuchalis***
	Downy Woodpecker	***Picoides pubescens***
	Hairy Woodpecker	***Picoides villosus***

*** - species with special designation**
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target species

Preinventory list of birds potentially occurring at Craig Mountain, Idaho.

	Common Name	Scientific name
*	White-headed Woodpecker	*Picoides albolarvatus*
*	Black-backed Woodpecker	*Picoides arcticus*
	Northern Flicker	*Colaptes auratus*
+	Pileated Woodpecker	*Dryocopus pileatus*
0	Olive-sided Flycatcher	*Contopus borealis*
0	Western Wood-Pewee	*Contopus sordidulus*
0	Willow Flycatcher	*Empidonax traillii*
0	Hammond's Flycatcher	*Empidonax hammondii*
0	Dusky Flycatcher	*Empidonax oberholseri*
0	Cordilleran Flycatcher	*Empidonax occidentalis*
0	Say's Pheobe	*Sayornis saya*
0	Western Kingbird	*Tyrannus verticalis*
0	Eastern Kingbird	*Tyrannus tyrannus*
F	Homed Lark	*Eremophilia alpestris*
0	Tree Swallow	*Tachycineta bicolor*
0	Violet-green Swallow	*Tachycineta thalassina*
0	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
0	Bank Swallow	*Riparia riparia*
0	Cliff Swallow	*Hirundo pyrrhonota*
0	Barn swallow	*Hirundo rustica*
	Gray Jay	*Perisoeus canadensis*
	Steller's Jay	*Cyanocita stelleri*
	Blue Jay	*Cyanocita cristata*
	Clark's Nutcracker	*Nucifraga columbiana*
	Black-billed Magpie	*Pica pica*
	American Crow	*Corvus brachyrhnchos*
	Common Raven	*Corvus corax*
+	Black-capped Chickadee	*Parus atricaphillus*
	Mountain Chickadee	*Parus gambeli*
	Chestnut-backed Chickadee	*Parus rufescens*
	Red-breasted Nuthatch	*Sitta canadensis*
	White-breasted Nuthatch	*Sitta carolinensis*
*	Pygmy Nuthatch	*Sitta pygmue*
F	Brown Creeper	*Certhia americana*
F	Rock Wren	*Salpinctes obsoletus*

*** - species with special designation**
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target species

Preinventory list of birds **potentially** occurring at Craig Mountain, Idaho.

	Common Name	**Scientific name**
	Canyon Wren	*Catherpes mexicanus*
0	House Wren	*Troglodytes aedon*
	Winter Wren	*Troglodytes troglodytes*
	American Dipper	*Cinclus mexicanus*
	Golden-crowned Ringlet	*Regulus satrapa*
F	Ruby-crowned Ringlet	*Regulus calendula*
0	Western Bluebird	*Sialia mexicana*
F	Mountain Bluebird	*Sialia currucoides*
F	Townsend's Solitaire	*Myadestes townsendi*
0	**Veery**	*Catharus fuscescens*
0	Swainson's Thrush	*Catharus ustulatus*
0	Hermit Thrush	*Catharus* guttatus
F	American Robin	*Turdus migratorius*
	varied Thrush	*Ixoreus naevius*
0	Gray Catbird	*Dumetella carolinensis*
0	Northern Mockingbird	*Mimus polyglottos*
0	Sage Thrasher	*Oreoscoptes montanus*
F	American **Pipit**	*Anthus spincletta*
	Bohemian **Waxwing**	*Bombycilla garrulus*
F	*cedar* **Waxwing**	*Bombycilla cedorum*
	Northern Shrike	*Lanius excubitor*
F *	Loggerhead Shrike	*Lanius ludovicianus*
	European Starling	*Sturnus vulgaris*
0	Solitary Vireo	*Vireo solitarius*
0	Warbling Vireo	*Vireo gilvus*
0	Red-eyed Vireo	*Vireo olivaceus*
0	Orange-Crowned Warbler	*Vermivora celata*
0	Nashville Warbler	*Venniwra ruficapilla*
0+	Yellow Warbler	*Dendroica petechia*
F	**Yellow-rumped** Warbler	*Dendroica coronata*
0	Townsend's Warbler	*Dendroica townsendi*
0	American Redstart	*Setophaga ruticilla*
0	**MacGillivray's** Warbler	*Oporomis tolmiei*
0	Common Yellowthroat	*Geothylpis trichas*
0	Wilson's Warbler	*Wilsonia pusilla*

*** - species with special designation**
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target species

Preinventory list of birds potentially occurring at Craig Mountain, Idaho.

	Common Name	Scientific name
0	Yellow-breasted Chat	*Icteria virens*
0	Western Tanager	*Piranga ludoviciana*
0	Black-headed Grosbeak	*Pheuticus melanocephalus*
0	Lazuli Bunting	*Passerina amoena*
F	Rufous-sided Towhee	*Pipilo erythrophthalmus*
	American Tree Sparrow	*Spizella arborea*
0	Chipping Sparrow	*Spizella passerina*
0	Brewer's Sparrow	*Spizella breweri*
0	Vesper Sparrow	*Pooecetes gramineus*
0	Lark Sparrow	*Chondestes grammacus*
0	Savannah Sparrow	*Passerculus sandwichensis*
0	Grasshopper Sparrow	*Ammodramus savannarum*
F	Fox Sparrow	*Passerella iliaca*
	Song Sparrow	*Melospiza melodia*
0	Lincoln's Sparrow	*Melospiza lincolnii*
F	White-crowned Sparrow	*Zonotrichia leucophrys*
	Harris' Sparrow	*Zonotrichia querula*
F	Dark-eyed Junco	*Junco hyemalis*
	Lapland Longspur	*Calcarius lapponicus*
	Snow Bunting	*Plectrophenax nivalis*
0	Bobolink	*Dolichonyx oryzivorus*
F	Red-winged Blackbird	*Agelaius phoeniceus*
F	Western Meadowlark	*Stumella neglecta*
F	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
F	Brewer's Blackbird	*Euphagus cyanocephalus*
0	Brown-headed Cowbird	*Molothrus ater*
0	Northern Oriole	*Icterus galbula*
	Rosy Finch	*Leucosticte arctoa*
	Pine Grosbeak	*Pinicola enucleator*
	Purple Finch	*Carpodacus purpureus*
F	Cassin's Finch	*Carpodacus cassinii*
	House Finch	*Carpodacus mexicanus*
	Red Crossbill	*Loxia curvirostra*
	White-winged Crossbill	*Loxia leucoptera*
	Common Redpoll	*Carduelis flammea*

*** - species with special designation**
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target specie6

Preinventory list of birds potentially **occurring** at Craig Mountain, Idaho.

	Common Name	Scientific name
F	Pine Siskin	*Carduelis pinus*
F	American Goldfinch	*Carduelis tristis*
	Evening Grosbeak	*Coccothrastes vespertinus*
	House **Sparrow**	*Passer domesticus*

179 species
18 species with special designation
35 facultative **neotropical** migrants
66 obligate neotropical **migrants**
3 target species

*** - species with special designation**
0 - obligate neotropical migrant
F - facultative neotropical migrant
+ - target species

Preinventory list of mammals potentially occurring at Craig Mountain, Idaho.

	Common Name	Scientific Name
	Masked shrew	*Sorex cinereus*
*	Preble's shrew	*Sorex preblii*
	Vagrant shrew	*Sorex vagrans*
	Dusky shrew	*Sorex monticolus*
	Merriam's shrew	*Sorex merriami*
	Water shrew	*Sorex palustris*
	Pygmy shrew	*Microsorex hoyi*
*	Coast mole	*Scapanus orarius*
	Little brown myotis	*iuyotis lucifugus*
	Yuma myotis	*Myotis yumanensis*
	Long-eared myotis	*Myotis evotis*
*	Fringed myotis	*Myotis thysanodes*
	Long-legged myotis	*Myotis volans*
*	California myotis	*Myotis californicus*
	Small-footed myotis	*Myotis ciliolabrum*
	Silver-haired bat	*Lasionycteris noctivagans*
*	Western pipistrelle	*Pipstrellus hesperus*
	Pallid bat	*Antrowus pallidus*
	Big brown bat	*Eptesicu fuscus*
*	Spotted bat	*Euderma maculata*
	Hoary bat	*Lasiurus cinereus*
*	Townsend's big-eared bat	*Plecotus townsendii*
	Mountain cottontail	*Sylvilagus nuttallii*
	Snowshoe hare	*Lepus americanus*
	White-tailed jackrabbit	*Lepus townsendii*
	Yellow-pine chipmunk	*Eutamias anwenus*
	Red-tailed chipmunk	*Eutamius ruficaudus*
	Yellow-bellied marmot	*Marmota flaviventris*
	Columbian ground squirrel	*Spermophilus columbianus*
	Golden-mantled ground squirrel	*Spernwphilus lateralis*
	Red squirrel	*Tamiasciurus hudsonicus*
*	Northern flying squirrel	*Glaucomys sabrinus*
	Northern pocket gopher	*Thomomys talpoides*
	Great basin pocket mouse	*Perognathus parvus*
	Beaver	*Castor canadensis*
	Western harvest mouse	*Reithrodontomys megalotis*
	Deer mouse	*Peromyscus maniculatus* .

* species with special designation
\+ target species

Preinventory list of mammals potentially ‘occurring at Craig Mountain, Idaho.

Common Name	Scientific Name
Bushy-tailed woodrat	*Neotoma cinerea*
Southern red-backed vole	*Clethrionomys gapperi*
Montane vole	*Microtus montanus*
Long-tailed vole	*Microtus longicaudus*
Muskrat	*Ondatra zibethicus*
House mouse	*Mus musculus*
Western jumping mouse	*Zapus princeps*
Porcupine	*Erethizon dorsatum*
coyote	*Canis latrans*
Red fox	*vulpes vulpes*
Black bear	*ursus americanus*
Raccoon	*Procyon lotor*
Marten	*Martes americana*
Ermine	*Mustela erminea*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Badger	*Taxidea taxus*
Striped skunk	*Mephitis mephitis*
Spotted sunk	*Spilogale gracilis*
*+ River otter	*Lutra canadensis*
Mountain lion	*Felis concolor*
* Lynx	*Felis lynx*
Bobcat	*Felis rufus*
+ Elk	*Cervus elaphus*
+ Mule deer	*Odocoileus hemionus*
+ White-tailed deer	*Odocoileus virginianus*
Moose	*Alces alces*
Bighorn sheep	*Ovis canadensis*

65 species
9 species with special designation
4 target species

* species with special designation
\+ target species

APPENDIX B

Raptor surveys conducted at Craig Mountain, 1993 and 1994

RAPTOR SURVEY OF THE LOWER SALMON AND SNAKE RIVERS, APRIL 1993

by

Carol Bradford and Frances Cassirer
Conservation Data Center
Nongame and Endangered Wildlife Program
Bureau of Wildlife

September 1993

Idaho Department of Fish and Game
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Cooperative Challenge Cost-Share Project
Idaho Department of Fish and Game
Bureau of Land Management

ABSTRACT

Twelve raptor species were recorded during surveys conducted along the Lower Salmon and Snake River Canyons April 2-April 14, 1993. Golden eagles were the most commonly observed species, followed by red-taiied hawks and American kestrels. Prairie falcons, northern harriers, northern goshawks, Cooper's hawks, sharp-shinned hawks, and turkey vultures were less frequently observed. A single bald eagle was seen. Suitable peregrine falcon nesting habitat was present, but no peregrine falcons were observed.

The abundance of golden eagles relative to other raptors was higher than that suggested by previous surveys in the same area, possibly due to differences in survey methodology, observers, weather conditions, or actual changes in the raptor community. Suggestions are made for future surveys to better quantify raptor numbers and distribution. Helicopter surveys are recommended for documenting golden eagle nesting activity and for supplementing peregrine falcon surveys. Ground surveys are recommended for continued peregrine falcon inventory and for monitoring overall raptor community structure and abundance.

INTRODUCTION

This study was initiated to better document the raptor community in north-central Idaho along the Lower Salmon River and in lower Hells Canyon on the Snake River. The Lower Salmon River has been recommended for designation as a Scenic River under the Wild and Scenic Rivers Act and is classified as a BLM Area of Critical Environmental Concern, because of its important resource values (flora, fauna, scenic, cultural, and recreational). The study also served as part of an inventory of wildlife mitigation lands located near the confluence of the Snake and Salmon Rivers that were recently purchased by the Bonneville Power Administration (Bonneville Power Administration et al. 1992). Little quantitative information is available on the nongame bird species that inhabit or use this area. The goal of this survey was to determine the distribution and relative abundance of raptors.' Because raptors are visible, topline predators, many land management agencies use them as indicators of ecosystem health.

The few raptor surveys conducted in the area prior to this study were done to provide input for the Wild and Scenic River Study of the Lower Salmon (Kochert 1977, Fisher 1978) and to present measures for protecting raptor nesting and roosting sites in association with dam construction on the Snake River (Asherin and Claar 1976). These studies were conducted primarily by helicopter', supplemented by boat and ground surveys. Surveys were conducted along the Lower Salmon River from Whitebird, Idaho

to its confluence with the Snake River in the Hells Canyon area, and down the Snake River to the Grande Ronde River. The American kestrel was the most commonly observed species in these previous surveys. Red-tailed hawks and golden eagles followed kestrels in abundance.

A peregrine falcon helicopter survey was also conducted in the vicinity of Snow Hole Rapids on the Lower Salmon River and Cottonwood Creek on the Snake River in 1979. Although the areas surveyed had been identified as excellent nesting substrate and hunting habitat for peregrine falcons (Kochert 1977) none were observed. Gusty wind conditions made the area difficult to survey and survey time was minimal (Johnson 1979).

In addition, mid-winter bald eagle counts are conducted periodically by helicopter on the Lower Salmon and annually by boat on the Snake River (Cottonwood BLM, unpubl. data). Golden eagles are also tallied in these mid-January surveys.

Information from the present study and others like it ultimately provide valuable information for managing the land, people, and wildlife along the river corridor. Specifically, raptor survey data can be used to protect individual raptor species, especially sensitive or endangered species, and their nest and roosting sites.

STUDY AREA

The landscape of the Lower Salmon River and Hells Canyons is diverse and austere. The rivers cut through narrow, deep,

desert-like canyons with dramatic topographic variation; vertical rock cliffs juxtaposed with wide, tiered grasslands. The Salmon River canyon is deeper than the Grand Canyon, and the Salmon is the longest free-flowing river in the contiguous United States. There are many rapids and sandy beaches along the river. Forests and arid rangeland in the upper reaches of the canyon extend to and beyond the canyon rim. While much of the river canyon is roaded, there are also large roadless areas.

The area has an extensive and varied cultural history. Native Americans have inhabited this canyon for over 10,000 years, and, since the 1860's, the land has been mined, farmed, and grazed. Currently the river corridor is extensively grazed by cattle, and the river is used by recreationists, both private and commercial. The majority of the area is public land administered by the Bureau of Land Management, the U.S. Forest Service, and more recently, the Idaho Department of Fish and Game.

Hells Canyon on the Snake River has a topography similar to the Lower Salmon--steep narrow canyons alternating with more wide open grasslands. Overall, it is a deeper canyon, though only by about 100 m, with longer continuous steep vertical cliffs. The Snake River is larger and managed differently than the Lower Salmon. Hells Canyon is a U.S. Forest Service National Recreational Area, and the flows on the Snake River are regulated by dams. As a result there has been a loss of sandy beaches on the upper reaches of Hells Canyon. Large jet boats are also more

common on the Snake River. Unlike the Lower Salmon River, the Snake River has a permit system for recreational nonmotorized boat use. Both river corridors have cliff walls and faces that provide excellent raptor nesting, foraging, and roosting sites.

The area surveyed encompassed 96 km of the Lower Salmon River corridor from the Hammer Creek boat launch (RM 53) to the confluence of the Salmon and Snake Rivers, and 11.2 km on the Snake River corridor from its confluence with the Lower Salmon to Cottonwood Creek (RM 181.2) (Fig. 1).

METHODS

Surveys were conducted April 2 to April 14, 1993. This period was selected as the optimal time to observe raptors along the river corridor because it provided the maximum overlap in breeding chronologies. Golden eagles were incubating; red-tailed hawks were laying and incubating, and both prairie and peregrine falcons were laying (Kochert et al. 1977, R. Lehman pers. comm., E. Levine pers. comm.).

Survey methods were similar to those used in the BLM Snake River Birds of Prey Area (Kochert et al. 1991). Surveys were conducted from 20 observation points at approximately 3-km intervals: 17 on the Lower Salmon River and 3 on the Snake River in Hells Canyon National Recreation Area (Fig. 1). The majority of observation points were 1-30 m from the river's edge on either side of the river. There were 3 observers at the first (upstream) 12 points and 2 observers at the last 8 points.

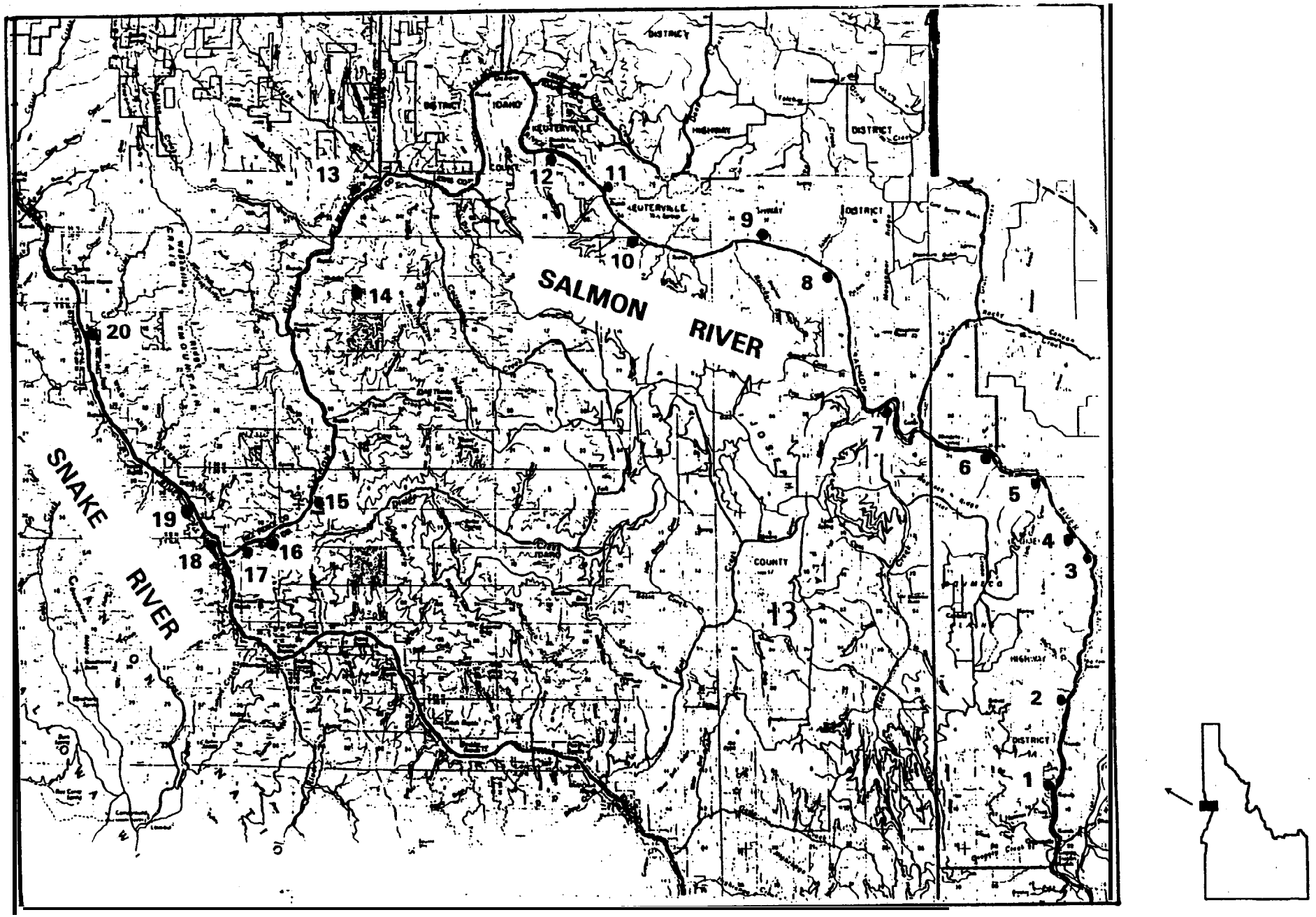

Figure 1. Raptor survey area, April 1993. Numbers 1 – 20 refer to observation points described in text.

Nine (45%) of the observation points were surveyed for 1.5-2.0 hours; 5 (25%) were surveyed for 2-3 hours; and 6 (30%) were observed for 3-7 hours.

All surveys were conducted from the ground and limited primarily to cliff habitats adjacent to the river corridor. The survey area was defined as the area visible from a given observation point in which raptors could be seen and positively identified. In all cases, the observation point selected offered a panoramic view of the nearest cliff faces.

Survey points were not evenly distributed because of selection for cliff habitat and/or the interference of rapids. Because of limited time and personnel during this river survey, suitable areas.on the river not near a road were given priority when choosing survey points. Thus, an abundance of available raptor habitat was not surveyed.

Optimal weather conditions for surveying include little or no wind, fog, or rain. Although no surveying was done during downpours of rain or hail, unstable weather is typical for this time of year. Due to time constraints, surveys were often conducted during suboptimal weather conditions. Also, for logistical reasons associated with conducting a river trip, surveying was conducted primarily from mid-morning' through mid-afternoon, although peak activity of nesting raptors is in the early morning and late afternoon.

Observations were recorded on a survey form (Appendix A) modified from those used in peregrine falcon surveys (Levine

1992). All raptors sighted and their specific activities were 'recorded. Any raptor observed exhibiting territorial defense, courtship behavior, or nesting behavior was assumed to be occupying a breeding territory (Steenhof 1987). Observations were given the following designations:

Individual bird sighted

Pair of individuals sighted (P)

Pair or individual exhibiting territorial behavior (T)

Occupied nest site identified (N)

Survey equipment included Swift 15x60 spotting scopes, Bushnell 20x45 spotting scope, Nikon 8x25 binoculars, Nikon 8x40 binoculars, and Minolta 10x42 binoculars.

RESULTS

Twelve species of raptors were recorded: turkey vulture (Catharteg aura), golden eagle (Aquila chrvsaetos), bald eagle (Haliaeetus leucocenhalus), northern harrier (Circus cvaneus), sharp-shinned hawk (Acciniter striatus), Cooper's hawk (Acciniter cooperii), northern goshawk (Acciwiter aentilis), red-tailed hawk (Buteo iamaicensis), American kestrel (Falco swarverius), prairie falcon (Falco mexicanus),. western screech owl (Otus kennicotti), and great horned owl (Bubo virainianus) (Table 1). A mean of 3.2 raptor species were recorded at each observation point. The golden eagle was observed at 18 of the 20 survey points and was the most commonly observed raptor (an estimated 33 individuals). The second and third most commonly observed raptor species were

Table 1. Raptors observed along the lower Salmon River and the Snake River to Cottonwood Creek, Idaho, April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations'
1	Lower Salmon RM 54	552700	5069100	4/2	2	2 prairie falcons (P,T) 2 red-tailed hawks (P,T) 2 red-tailed hawks (P,T) 2 golden eagles (P) 1 northern harrier 1 American kestrel
2	Lower Salmon RM 49.6 Lyons-Bar	553300	5072450	4/2	2	2 golden eagles (P,T) 1 northern harrier 1 red-tailed hawk (T)
3	Lower Salmon RM 45.3 Shorts Bar	554600	5078450	4/3	2	2 prairie falcons (P,T) 2 golden eagles (P,T) 1 golden eagle subadult 2 northern harriers (P)
4	Lower Salmon RM 44.5	553800	5079200	4/3	2	1 golden eagle subadult 1 golden eagle 1 northern harrier 1 American kestrel 1 UNID Accipiter (Cooper's hawk or northern goshawk) 1 Cooper's hawk
5	Lower Salmon RM 42.8 Pine Bar,	552050.	5081700	4/4	7	2 golden eagles (P) 2 golden eagles (P) 2 red-tailed hawks (P,N) 2 red-tailed hawks (P) 1 bald eagle 1 northern harrier

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to Cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations'
6	Lower Salmon RM41	549900	5082600	4/5	1	1 golden eagle 2 red-tailed hawks (P,T) 1 accipiter (UNID) (probable northern goshawk) 1 accipiter (UNID)
7	Lower Salmon RM 37	545400	5084500	4/5	1	1 golden eagle 2 red-tailed hawks (P) 1 American kestrel
8	Lower Salmon RM 32.5 Cougar Canyon	542950	5090000	4/6	1.5	2 golden eagles (P,T) 2 golden eagles (subadults) 2 turkey vultures 1 northern harrier 1 sharp-shinned hawk 2 American kestrels (P) 1 falcon (UNID)
9	Lower Salmon RM 30.6 Cougar Canyon	540300	5091200	4/6	1.5	1 golden eagle
10	Lower Salmon RM 27.2	534400	5091400	4/7	1.5	1 golden eagle (subadult) 1 American kestrel 1 sharp-shinned hawk 1 northern goshawk 2 turkey vultures (P)

• P = pair, T = pair or individual exhibiting territorial behavior, N = neat observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	U T M N	Date	Hours Obs.	Observations'
11	Lower Salmon RM 25.3	533050	5093100	4/7	3	2 golden eagles (P,T) 1 American kestrel (T) 1 turkey vulture 1 northern harrier 1 northern goshawk 2 red-tailed hawks (P,T) 2 red-tailed hawks (P,T)
12	Lower Salmon RM 23.2 Snow Hole	530700	5095200	4/8	3	2 golden eagles (P,T,N) 1 golden-eagle 1 golden eagle (subadult) 2 red-tailed hawks 1 sharp-shinned hawk 1 American kestrel
13	Lower Salmon RM 12.5 Eagle Creek beach	522000	5092800	4/9	3	1 golden eagle 1 red-tailed hawk 1 northern goshawk
14	Lower Salmon RM 10 Skeleton Creek	522000	5089200	4/10	1.5	1 American kestrel 2 red-tailed hawks (P) 1 great horned owl
15	Lower Salmon RM 3.4 Slide Rapid	520100	5080700	4/11	1.5	1 American kestrel 2 red-tailed hawks (P) 2 red-tailed hawks (P)
16	Lower Salmon RM 1.5	517900	5078500	4/11	4	2 prairie falcons (P, T, Copulating) 2 golden eagles (P)

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to Cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	U T M N	Date	Hours Obs.	Observations*
17	Lower Salmon RM 0.4 Eye of the Needle	517050	5078200	4/12	1.5	1 golden eagle 1 American kestrel
18	Snake River RM 187.8 Confluence	515850	5785000	4/12	1	1 golden eagle
19	Snake River RM 186.8 Cave	514800	5079700	4/12	2	1 golden eagle (T) 2 American kestrels (P)
20	Snake River RM 181.2 Cottonwood Creek Beach	510100	5085700	4/13	6	2 American kestrels (P,T) 1 Cooper's hawk
				4/14	3	1 golden eagle 1 red-tailed hawk (N)

* P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

red-tailed hawks (11 points, 27 individuals) and American kestrels (12 points, 15 individuals). The most infrequently observed diurnal raptor was the bald eagle (1 observation). While boating between Maloney Creek and Eagle Creek we observed a western screech owl. A great horned owl was heard at the Skeleton Creek campsite.

An average of 2.5 raptors were recorded per hour of observation, but observation rates were highly variable (Table 2). The greatest frequency of observations (7.3/hr) was in Cougar Canyon on the Salmon at RM 32.5 (point 8). The lowest frequencies of observations (0.7 and 0.6/hr) were 2 miles downstream on the Salmon River also in Cougar Canyon (point 9), and on the Snake River at Cottonwood Creek (point 20).

One occupied golden eagle nest was observed with an adult incubating. Two occupied red-tailed hawk nests were observed with adults incubating (Appendix B). A total of 32 pairs or nesting areas were documented: 3 prairie falcon, 10 golden eagle, 13 red-tailed hawk, 1 northern harrier, 4 American kestrel, and 1 turkey vulture (Table 1).

DISCUSSION

This study indicates that the Lower Salmon River Canyon and to a lesser extent Lower Hells Canyon on the Snake River provide nesting and foraging habitat for a large number and variety of raptor species. Results of this initial survey suggest high densities of golden eagles, perhaps similar to those in the Snake

Table 2. Observation rates (birds/hr) of raptors at 20 points along the Lower Salmon and Snake Rivers, April 2 - 14, 1993.

Obs. Pt.	All Raptors	NOHA[a]	PRFA	AMKS	GOEA	BALD	RTHA	TWU	SSHA	COHA	NOGO	GHOW	UNID
1	4	0.5	1	0.5	1	0	2	0	0	0	0	0	0
2	2	0.5	0	0	1	0	0.5	0	0	0	0	0	0
3	1.4	0.5	1	0	1.5	0	0	0	0	0	0	0	0.5
4	2.5	0.5	0	0.5	1	0	0	0	0	0.5	0	0	0
5	1.4	0.1	0	0	0.6	0.1	0.6	0	0	0	0	0	0
6	4	0	0	0	1	0	2	0	0	0	1	0	1
7	4	0	0	1	1	0	2	0	0	0	0	0	0
8	7.3	0.7	0	1.3	2.6	0	0	1.3	0.7	0	0	0	0.7
9	0.7	0	0	0	0.7	0	0	'0	0	0	0	0	0
10	4	0.7	0	0.7	0.7	0	0	1.3	0.7	0	0	0	0
11	3.3	0	0	0.3	0.7	0	1.3	0.3	0	0	0	0	0
12	2.3	0	0	0.3	1	0	0.7	0	0.3	0	0	0	0
13	1	0	0	0	0.3	0	0.3	0	0	0	0	0	0
14	2.6	0	0	0.7	0	0	1.3	0	0	0	0	0.7	0
15	3.3	0	0	0.7	0	0	2.6	0	0	0	0	0	0
16	1	0	0.5	0	0.5	0	0	0	0	0	0	0	0
17	1.3	0	0	0.7	0.7	0	0	0	0	0	0	0	0
18	1	0	0	0	1	0	0	0	0	0	0	0	0
19	1.5	0	0	1	0.5	0	0	0'	0	0	0	0	0
20	0.7		0	0.2	0.2	0	0.1	0	0	0.1	0	0	0
Avg/hr	2.5			0.4	0.9,	-	0.7	-	-				
S.D.	1.7			0.4	0.6	-	0.9	-					
Median	2.2	0	0	0.3	0.7	0	0.2	0	0	0	0	0	0
Min.	0.6	0	0	0	0	0	0	0	0	0	0	0	0
Ma%.	7.3	0.7	1	1.3	2.6	0.1	2.6	1.3	0.1	0.5	1	0.7	1

[a] NOHA - northern harrier, PRFA - prairie falcon, AMKS - American kestrel, GOEA - golden eagle, BALD - bald eagle, RTHA - red-tailed hawk, TUVU - turkey vulture, SSHA - sharp-shinned hawk, COHA - Cooper's hawk, NOGO - northern goshawk, GHOW - great horned owl

River Birds of Prey Area (SRBPA) (compare approximately 1 pair per 4.2 km, 1993 for SRBPA, R. Lehman, pers. comm., with 1 pair approximately every 5.3 km for Lower Salmon/Hells Canyon). However, since the Lower Salmon/Hells Canyon survey was fairly extensive over a short period of time, few actual nest sites were observed. Therefore, results may not be completely comparable.

It does seem likely that there may be more golden eagles in the study area than were observed. Since surveying was only performed from the river corridor, birds foraging above the corridor or nesting on rims or up side canyons may have been missed by this survey. Cold, rainy, and snowy weather also influenced results. Raptor activity fell off dramatically during inclement weather and borderline bad weather. Also, estimates of actual numbers were reduced because most golden eagles would have been incubating during the study period (Puller and Mosher 1987). More intensive work would be required to make accurate comparisons with nesting densities in other areas.

Relative abundance of raptors observed in this survey differed from that reported in previous surveys. This may be due to survey methodology (aerial and ground 1976-1978 versus ground alone in this study), weather conditions, observer variablity, or to actual changes in the raptor community. Surveys in the late 1970's found fewer golden eagles and many more American kestrels than were observed in this study. American kestrels (36) and red-tailed hawks (29) were observed much more frequently than golden eagles (18) in the 1978 study. The 1977 study revealed an

almost equal number of golden eagles (21) and American kestrels (22) and very few red-tailed hawks (7). The results from the Asherin (1976) study are not directly comparable since the study area included only the Snake River corridor, but kestrels were also the most frequently observed raptor in that survey. In the 1993 survey; an estimated 33 golden eagles, 27 red-tailed hawks, and 15 American kestrels were observed, almost the inverse of the 1978 survey.

The number of prairie falcons observed in this study (6 birds) is comparable to the 1978 study (4 birds and 9 scrapes). No peregrine falcons were observed in either the 1977-78 studies or in this survey of the same study area. Peregrine falcons were, however, successfully nesting in Hells Canyon as late as 1965. The species was reported hunting in the same area in 1976 (Fisher 1978). Since 1986, 73 peregrines have been released at 3 hack sites within the vicinity of Hells Canyon on both the Oregon and Idaho sides of the Snake River (Heinrich 1986, 1987, 1988, 1989, 1990, 1991, 1992). Peregrines have also been hacked at Asotin, Washington, and near the Little Salmon River. At least 2 nests have been established on the Salmon and Snake Rivers outside the area covered in this survey. The Lower Salmon River Canyon and Hells Canyon NRA both contain a tremendous amount of potential cliff nesting habitat for peregrines (Levine 1992) that remains to be adequately surveyed for occupancy.

No recent bald eagle nesting activity has been reported in the study area and none was observed in this survey. The area is

apparently primarily used as a wintering area by bald eagles from December-February (Cottonwood BLM, unpubl. data).

RECOMMENDATIONS

The Lower Salmon Canyon and Hells Canyon provide habitat for a large number and diversity of raptors. The high numbers of golden eagles alone justify further surveys and research. If the density of golden eagles is as high or higher than that of the SRBPA, then significant reasons exist for protecting and studying the river, its corridor, and the wildlife it supports. To confirm the actual nesting density of golden eagles, 2 helicoptor surveys for nest sites should be made--l during incubation in April and 1 prior to fledging in May. These should be combined with ground surveys to better document nesting activity.

The possibility that peregrine falcons may be nesting in, or using the area, also would justify further protection and study. Surveys to detect peregrine falcons should target suitable nesting areas with repeated, intensive searches. Survey points should be located on the river, in suitable side-canyons, and possibly on the canyon rim. Helicopter surveys for further habitat assessment and to follow up any potential ground observations could becombined with golden eagle helicopter surveys.

Continued monitoring at the points established in this study is also recommended. Baseline monitoring can be used to help document any changes in the raptor community in response to .

management activities, and this information can be used in future management plans. Observation times should be standardized to 2 hours per point to minimize the factors potentially accounting for different observation rates at each point. Future surveys could also include additional points, time permitting. Additional observers and 2 boats would provide better coverage of the area, and could possibly allow combining a general raptor survey with a peregrine survey.

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Appendix A

Raptor survey form

RAPTOR SURVEY-FORM

LOCATION: **DATE:**

SURVEY POINTS:

OBSERVERS:

TIME: Start = Finish = Total =

DESCRIPTION OF AREA OBSERVED:

WEATHER CONDITIONS:

CONDITIONS FOR HEARING:

RAPTORS OBSERVED:

	Species	Age	Sex	Behavior
1.				
2.				
3.				
4.				
5.				

(Behavior Code: 0=unknown, l=territory defense
2=courtship, 3=incubation
4=nestlings, 5=fledgings, 6=other)

OTHER BIRD SPECIES OBSERVED:

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

PLEASE RECORD: (Use back of page if needed)

A. **FOR ALL RAPTORS OBSERVED:**
   1. General behavior
   2. Descriptions of nest site locations if known
   3. Miscellaneous (photos, sketches, items collected, etc.)

SPECIES LIST

ON ATTACHED MAP PLOT:
1. cliffs surveyed and observations points
2. Raptors observed: perches, nest sites, flight paths, etc.

Appendix B

Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1993

Appendix B. Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1993.

Species	Location	UTM East	UTM North
Red-tailed Hawk	Across Snake River from Cottonwood Cr. (Oregon)	509850	5087950
Red-tailed Hawk	Pine Bar	552250	5081850
Golden Eagle	Snowhole Rapids	530700	5094800

RAPTOR SURVEY OF THE LOWER SALMON AND SNAKE RIVERS, APRIL 1994

by

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August 1994

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ABSTRACT

Eight diurnal and 2 nocturnal raptor species were recorded during surveys conducted along the Lower Salmon River and Snake River canyons April 4-April 15, 1994. Golden eagles were the most commonly observed species, followed by red-tailed hawks and northern harriers. Prairie falcons, American kestrels, osprey, and sharp-shinned hawks were less frequently observed. Western screech-owls and great-horned-owls were also recorded. Suitable peregrine falcon nesting habitat was present, but no peregrine falcons were observed.

Relative abundance of all raptors was lower than that recorded by last year's survey in the same area. This may have been partially due to weather conditions.

suggestions are made for future surveys to better quantify raptor numbers and distribution. Helicopter surveys are recommended for documenting golden eagle nesting activity- and for supplementing peregrine falcon surveys. Ground surveys are recommended for continued peregrine falcon inventory and for monitoring overall raptor community structure and abundance.

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INTRODUCTION

This study represents the second consecutive year of a river survey conducted to better document the raptor community in north-central Idaho along the 'Lower Salmon River and in lower Hells Canyon on the Snake River (Bradford and Cassirer 1994). The survey was repeated in an effort to continue quantifying raptor numbers and distribution. The study also served as part of an inventory of wildlife mitigation lands located near the confluence of the Snake and Salmon Rivers that were recently purchased by the Bonneville Power Administration (Bonneville Power Administration et al. 1992). A description of raptor surveys conducted prior to 1993 is presented in Bradford and Cassirer(1994).

Results from these studies provide information for resource management along the river corridors. Specifically, raptor survey data can be used to protect individual raptor species, especially sensitive or endangered species, and their nest and roosting sites.

STUDY AREA

The landscape of the Lower Salmon River and Hells Canyons is diverse and austere. The rivers cut through narrow, deep, desert-like canyons with dramatic topographic variation; vertical rock cliffs juxtaposed with wide, tiered grasslands. The Salmon River canyon is deeper than the Grand Canyon, and the Salmon is the longest free-flowing river in the contiguous United States. There are many rapids and sandy beaches along the river. Forests and arid rangeland in the upper reaches of the canyon extend to and beyond the canyon rim. While much of the river canyon is roaded, there are also large roadless areas.

Hells Canyon on the Snake River has a topography similar to the Lower Salmon--steep narrow canyons alternating with more wide open grasslands. Overall, it is a deeper canyon, though only by about 100 m, with longer, continuous, steep vertical cliffs. The Snake River is larger and managed differently than the Lower Salmon. Hells Canyon is a U.S. Forest Service National Recreational Area, and the flows on the Snake River are regulated by dams. Both river corridors have cliff walls and faces that provide excellent raptor nesting, foraging, and roosting sites.

The area surveyed encompassed 96 km of the Lower Salmon River corridor from the Hammer Creek boat launch (RM 53) to the confluence of the Salmon and Snake Rivers, and 11.2 km on the Snake River corridor from its confluence with the Lower Salmon to Cottonwood Creek (RM 181.2) (Fig. 1).

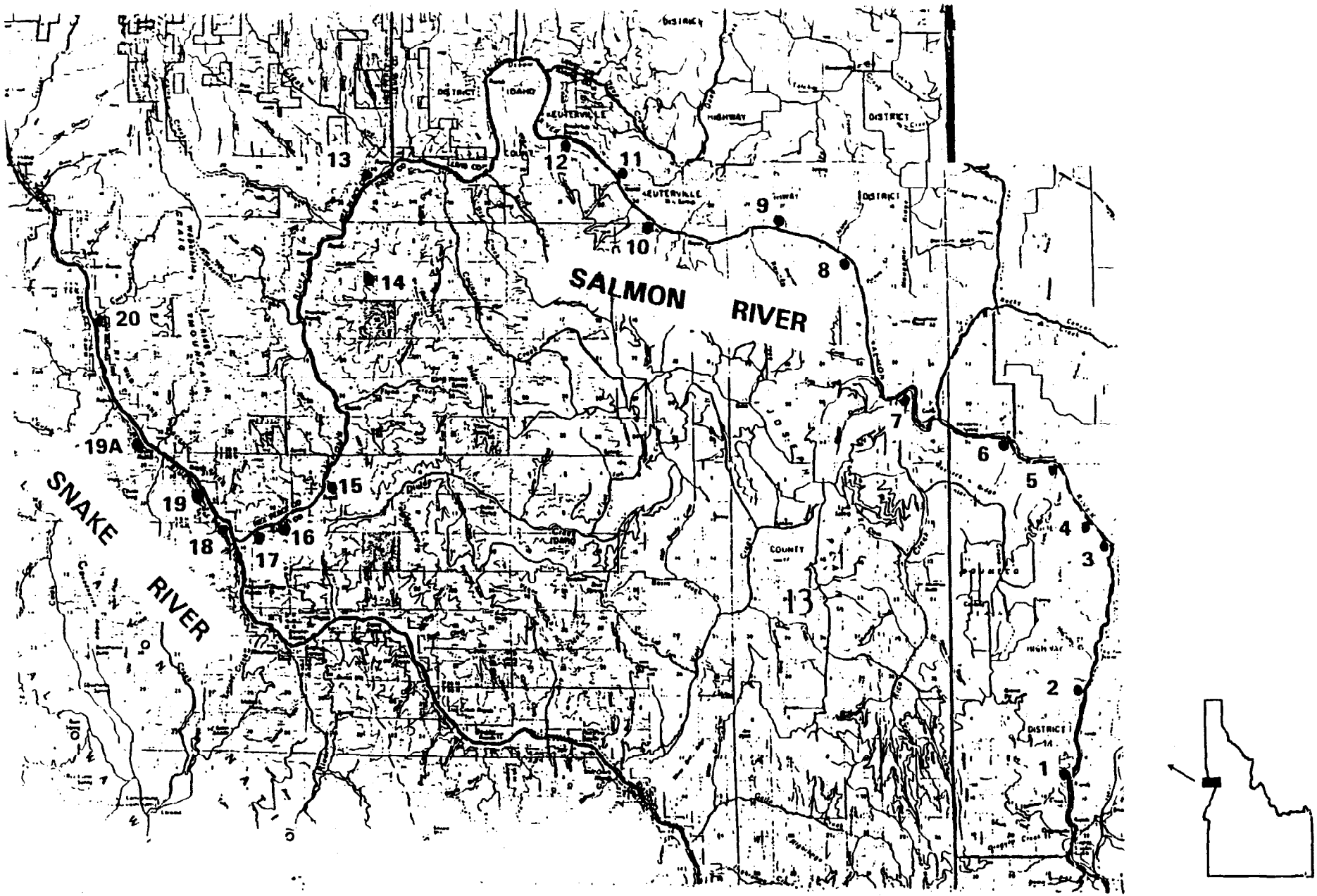

Figure 1. Raptor survey area, April 1994. Numbers 1 – 20 refer to observation points described in the text.

METHODS

Surveys were conducted April 4 to April 15, 1994, approximately the same time period as the initial survey in 1993. This period was selected as the optimal time to observe raptors along the river corridor because it provided the maximum overlap in breeding chronologies. Golden eagles were incubating; red-tailed hawks were laying and incubating, and both prairie and peregrine falcons were laying (Kochert et al. 1977, R. Lehman pers. comm., E. Levine pers. comm.).

Survey methods were similar to those used in the BLM Snake River Birds of Prey Area (Kochert et al. 1991) and were similar to those developed and used in 1993 (Bradford and Cassirer 1994). Surveys were conducted from 20 observation points at approximately ?-km intervals: 16 on the Lower Salmon River and 4 on the Snake River in Hells Canyon National Recreation Area (Fig. 1). One survey point was added (19A) and one was dropped (point 17) to better distribute sampling effort along the river. The majority of observation points were l-30 m from the river's edge on either side of the river. Each point was surveyed for 2 hours. There were 3 observers at the first (upstream) 5 points and 2 observers at the last 15 points.

All surveys were conducted from the ground and limited primarily to cliff habitats adjacent to the river corridor. The survey area was defined as the area visible from a given observation point in which raptors could be seen and positively identified. In all cases, the observation point selected offered a panoramic view of the nearest cliff faces.

Optimal weather conditions for surveying include little or no wind, fog, or rain. Unstable weather, however, is typical for this time of year. During the 1994 survey, rain and suboptimal survey conditions prevailed. Standardizing survey time of day was close to impossible due to variable weather. Also, for logistical reasons associated with conducting a river trip, surveying was conducted primarily from mid-morning through mid-afternoon, although peak activity of nesting raptors is in the early morning and late afternoon.

Observations were recorded on a survey form (Appendix A) identical to those developed for last year's study. All raptors sighted and their specific activities were recorded. Any raptor observed exhibiting territorial defense, courtship behavior, or nesting behavior was assumed to be occupying a breeding territory (Steenhof 1987). Observations were given the following designations:

Individual bird sighted
Pair of individuals sighted (P)
Pair or individual exhibiting territorial behavior (T)
Occupied nest site identified (N)

Survey equipment included Swift and Kowa 15x60 spotting scopes, Bushnell 20x45 spotting scope, Nikon 8x25 binoculars; Nikon 8x40 binoculars, and Minolta 10x42 binoculars.

RESULTS

During 1994 nine species of raptors were recorded: golden eagle (*Aquila* chrysaetos), northern harrier (Circus cyaneus), sharp-shinned hawk (Accipiter *striatus),* red-tailed hawk (*Buteo jamaicensis),* American kestrel (*Falco sparverius),* osprey *(Pandion halliaetus),* prairie falcon (*Falco* mexicanus), western screech owl *(Otus* kennicotti), and great horned owl (*Bubo* virginianus) (Table 1).

A mean of 2.2 raptor species were recorded at each observation point. Golden eagles were observed at 14 of 20 survey points and were the most commonly observed raptor (an estimated 29 individuals). The second and third most commonly observed raptor species were red-tailed hawks (9 points, 15 individuals) and northern harrier (6 points, 11 individuals). The most infrequently observed diurnal raptor was the sharp-shinned hawk (2 observations).

An average of 1.9 raptors were recorded per hour of observation (Table 2). The greatest frequency of observations (4/hr) was at Shorts Bar and in Green Canyon on the Salmon at RM 45.3 (point 3) and RM 44.5 (point 4), and at the confluence of the Salmon and Snake Rivers (point 18). The lowest frequencies of observations (0.5/hr) were in Cougar Canyon (point 8), and on the 2.4 km of the Salmon River (point 16).

One golden eagle nest and 2 red-tailed hawk nests were observed during the survey. Only 1 red-tailed hawk nest was occupied with adults incubating (Appendix B). A total of 13 pairs or nesting areas were documented: 2 prairie falcon, 3 golden eagle, 4 red-tailed hawk, and 2 northern harrier and 2 osprey (Table 1).

DISCUSSION

This study reinforces initial results from last year's and previous studies that the Lower Salmon River Canyon, and to a lesser extent Lower Hells Canyon on the Snake River, provide nesting and foraging habitat for a large number and variety of raptor species. Results of the 1994 survey suggest high densities of golden eagles, though not as high as last year's study suggested. However, there was more rain this year which definitely influenced results. When the sun came out the raptors came out. More activity resulted in more sightings.

Once again only a few golden eagle nest sites were observed. It seems likely, however, that there may be more golden eagles in the study area than were observed. Since surveying was only performed from the river corridor, birds foraging above the corridor or nesting on rims or up side canyons may have been missed by this survey. Golden eagles also would have been incubating. Certainly the almost constant bad weather influenced results. More intensive work would be required to make accurate comparisons with nesting densities in other areas.

Table 1. Raptors observed along the lower Salmon and Snake Rivers, April 4 - April 15, 1994.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[1]
1	Lower Salmon RM 54	552700	5069100	4/4	2	2 prairie falcons (P,T) 1 golden eagle 2 northern harrier (P) 2 northern harrier (P)
2	Lower Salmon RM 49.6 Lyons Bar	553300	5072450	4/4	2	1 golden eagle 2 osprey (P)
3	Lower Salmon RM 45.3 Shorts Bar	554600	5078450	4/5	2	2 prairie falcons (P,T) 1 golden eagle 1 golden eagle subadult 3 northern harriers 1 sharp-shinned hawk
4	Lower Salmon RM 44.5	553800	5079200	4/5	2	1 golden eagle subadult 2 golden eagles 2 red-tailed hawks (P) 1 northern harrier 1 American kestrel 1 sharp-shinned hawk
5	Lower Salmon RM 42.8 Pine Bar	552050	5081700	4/6	2	1 golden eagle subadult 2 red-tailed hawks (P,N) 2 osprey (P)

[1] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1 cont'd. Raptors observed along the lower Salmon and Snake Rivers, April 4 - April 15, 1994.

Point No.	Location	UTM E	U T M N	Date	Hours Obs.	Observations[1]
6	Lower Salmon RM41	549900	5082600	4/7	2	1 golden eagle 1 red-tailed hawk 1 northern harrier
	Lower Salmon RM 37	545400	5084500	4/7	2	2 red-tailed hawks (P)
8	Lower Salmon RM 32.5 Cougar Canyon	542950	5090000	4/8	2	1 UNID raptor
9	Lower Salmon RM 30.6 Cougar Canyon	540300	5091200	4/8	2	1 red-tail hawk 1 northern harrier
10	Lower Salmon RM 27.2	534400	5091400	4/9	2	None
11	Lower Salmon RM 25.3	533050	5093100	4/9	2	1 golden eagle 1 American kestrel (T) 1 UNID raptor
12	Lower Salmon RM 23.2 Snow Hole	530700	5095200	4/10	2	2 golden eagles (P,T,N) 1 golden eagle 2 red-tailed hawks

[1] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1 cont'd. Raptors observed along the lower Salmon and Snake Rivers, April 4 - April 15, 1994.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[a]
13	Lower Salmon RM 12.5 Eagle Creek beach	522000	5092800	4/11	2	2 golden eagles (P) 2 red-tailed hawks (P)
14	Lower Salmon RM 10 Skeleton Creek	522000	5089200	4/11	2	None
15	Lower Salmon RM 3.4 Slide Rapid	520100	5080700	4/12	2	1 golden eagle 2 red-tailed hawks 1 American kestrel
16	Lower Salmon RM 1.5	517900	5078500	4/12	2	1 great-horned owl
18	Snake River RM 187.8 Confluence	515850	5785000	4/13	2	1 golden eagle subadult 4 golden eagles 2 golden eagles (P) 1 northern harrier
19	Snake River RM 186.8 Cave	514800	5079700	4/13	2	1 golden eagle 1 American kestrel
19A	Snake River Geneva Bar	512300	5081750	4/13	2	3 golden eagles 1 American kestrel 1 UNID owl (possible western screech)
20	Snake River RM 181.2 Cottonwood Creek Beach	510100	5085700	4/13	2	2 golden eagles 1 red-tailed hawk

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest obeerved.

Table 2. Observation rates (birds/hr) of raptors **at 20** points along the Lower **Salmon and Snake Rivers, April 4 - 15, 1994.**

Obs. Pt.	All Raptors	NOHA[a]	PRFA	AMKS	GOEA	BALD	RTHA	OSPR	SSHA	GHOW	UNID
1	3.5	1	0	0	0.5	0	0	0	0	0	0
2	1.5	0	0	0	0.5	0	0	1	0	0	0
3	4	1.5	1	0	1	0	0	0	0.5	0	0
4	4	0.5	0	0.5	1.5	0	1	0	0.5	0	0
5	2.5	0	0	0	0.5	0	1	1	0	0	0
6	1.5	0.5	0	0	0.5	0	0.5	0	0	0	0
7	1	0	0	0	0	0	1	0	0	0	0
8	0.5	0	0	0	0	0	0	0	0	0	0.5
9	1	0.5	0	0	0	0	0.5	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	1.5	0	0	0.5	0.5	0	0	0	0	0	0.5
12	2.5	0	0	0	1.5	0	1	0	0	0	0
13	2	0	0	0	1	0	1	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	2	0	0	0.5	0.5	0	1	0	0	0	0
16	0.5	0	0	0	0	0	0	0	0	0.5	0
18	4	0.5	0	0.7	3.5	0	0	0	0	0	0
19	1	0	0	0.5	0.5	0	0	0	0	0	0
19A	2.5	0	0	0.5	1.5	0	0	0	0	0	0.5
20	1.5	0	0	0	1	0	0.5	0	0	0	0
Avg/hr	1.9			0.2	0.7	-	0.4	-	-	-	-
S.D.	1.3			0.3	0.8	-	0.5	-	-	-	-
Median	1.5	0	0	0	0.5	0	0	0	0	0	0
Min.	0	0	0	0	0	0	0	0	0	0	0
Max.	4	1.5	1	0.7	1.5	0	1.0	1.0	0.5	0.5	0.5

[a] **NOHA** - northern harrier, **PRFA** - prairie falcon, **AMKS** - American kestrel, GOEA - golden eagle, BALD - bald eagle, RTHA - red-tailed hawk, OSPR - osprey, SSHA - sharp-shinned hawk, GHOW - great horned owl

Table 3. Comparison of raptor observations along the lower salmon and Snake Rivers, 1993 and 1994.

	Observation rate (all raptors)		No. species observed	
Obs. Pt.	1993	1994	1993	1994
1	4	3.5	5	2
2	2	1.5	3	2
3	1.4	4	3	3
4	2.5	4	4	5
5	1.4	2.5	4	3
6	4	1.5	3	3
7	4	1	3	1
8	7.3	0.5	5	1
9	0.7	1	1	2
10	4	0	5	0
11	3.3	1.5	4	3
12	2.3	2.5	4	2
13	1	2	2	2
14	2.6	0	3	0
15	3.3	2	2	3
16	1	0.5	2	1
17	1.3	-	2	
18	1	4	1	3
19	1.5	1	2	2
19A		2.5		2
20	0.7	1.5	4	2
Average	2.5	1.9	3.1	2.1
S.D.	1.7	1.3	1.3	1.2
Median	2.2	1.5	3	2
Min.	0.6	0	1	0
Max.	7.3	4	5	5

Relative abundance of raptors observed in this survey differed from that reported in last year's survey. Though study results indicate lower density, few individuals, and fewer occupied nests, these results may not be completely comparable. Bad weather certainly influenced results. There were also fewer observers for most of the survey period (2 instead of 3). The overall ratio of various species, however, remained close to the same, though northern harriers replaced the American kestrel as the third most abundant species.

The number of prairie falcons observed in this study (4 birds) is also comparable to last year's study (6 birds). No peregrine falcons were observed either this year or last year. Peregrine falcons were, however, successfully nesting in Hells Canyon as late as 1965 and are currently nesting near Lucille on the Lower Salmon upstream from the study area. The species was reported hunting in the same area in 1976 (Fisher 1978). Since 1986, 73 peregrines have been released at 3 hack sites within the vicinity of Hells Canyon on both the Oregon and Idaho sides of the Snake River (Heinrich 1986, 1987, 1988, 1989, 1990, 1991, 1992). Peregrines have also been hacked at Asotin, Washington, and near the Little Salmon River. At least 2 nests have been established on the Salmon and Snake Rivers outside the area covered in this survey. The Lower Salmon River Canyon and Hells Canyon NRA both contain a tremendous amount of potential cliff nesting habitat for peregrines (Levine 1992) that remains to be adequately surveyed for occupancy.

No recent bald eagle nesting activity has been reported in the study area and none was observed in this survey. The area is apparently primarily used as a wintering area by bald eagles from December-February (Cottonwood BLM, unpubl. data).

RECOMMENDATIONS

The Lower Salmon Canyon and Hells Canyon provide habitat for a large number and diversity of raptors. Specifically, there are high numbers of golden eagles and excellent peregrine falcon nesting habitat. Because of the extreme variability of weather conditions during an otherwise optimal time for surveying, it would be beneficial and cost-effective to conduct at least 1 early spring helicopter survey every few years to determine the actual nesting density of golden eagles and also to detect any peregrine falcons, scrapes, or optimal cliff sites invisible from the river itself. Such a flyover of the main corridor and side canyons could then be followed by a river and/or ground survey 1-2 weeks later when weather conditions are likely to be more stable.

The following procedures are also suggested in an effort to standardize methodology during inclement weather. If a survey has been initiated and conducted for less than 15 minutes when rain or foul weather forces closure, the survey should be restarted from the beginning when the weather clears. If,

however, the survey has been proceeding for more than 15 minutes when terminated by bad weather it should be restarted from the point of termination when the weather allows. It is suggested that 1 to 2 extra days be included in the total trip time to allow for more flexibility in adjusting survey times around the variable weather or to do a survey point that has been rained out completely. One extra day was included in this year's trip schedule.

It is also recommended that funding beprovided for 2 boats, 1 outfitter, and 3 observers. One boat and outfitter could handle all camp duties and thus allow the observers to concentrate solely on surveying. Additional observers would provide better coverage.

-Surveys to artect peregrine falcons should target suitable nesting areas with repeated, intensive searches. Survey points should be located on the river, in suitable side-canyons, and possibly on the canyon rim. Helicopter surveys for further habitat assessment and to follow up any potential ground observations could be combined with golden eagle helicopter surveys.

Continued monitoring at the points established in this study is also recommended. Baseline monitoring can be used to help document any changes in the raptor community in response to management activities, and this information can be used in future management plans.

ACKNOWLEDGMENTS

Thanks to Craig Johnson, BLM Cottonwood Resource Area iologist; Frances Cassirer, Jay Crenshaw, Gregg Servheen, and . .isa Garrett, Idaho Department of Fish and Game.

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Appendix A

Raptor survey form

RAPTOR SURVEY FORM

LOCATION: **DATE:**

SURVEY POINTS:

OBSERVERS:

TIME: Start = Finish = Total =

DESCRIPTION OF AREA OBSERVED:

WEATHER CONDITIONS:

CONDITIONS FOR HEARING:

RAPTORS OBSERVED:

	Species	Age	Sex	Behavior
1.				
2.				
3.				
4.				
5.				

(Behavior Code: 0=unknown, l-territory defense
2=courtship, 3=incubation
4=nestlings, 5=fledgings, 6=other)

OTHER BIRD SPECIES OBSERVED:

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

PLEASE RECORD: (Use back of page if needed)

A. **FOR ALL RAPTORS OBSERVED:**
   1. General behavior
   2. Descriptions of nest site locations if known
   3. Miscellaneous (photos, sketches, items collected, etc.)

SPECIES LIST

ON ATTACHED MAP PLOT:
1. cliffs surveyed and observations points
2. Raptors observed: perches, nest sites, flight paths, etc.

Appendix B

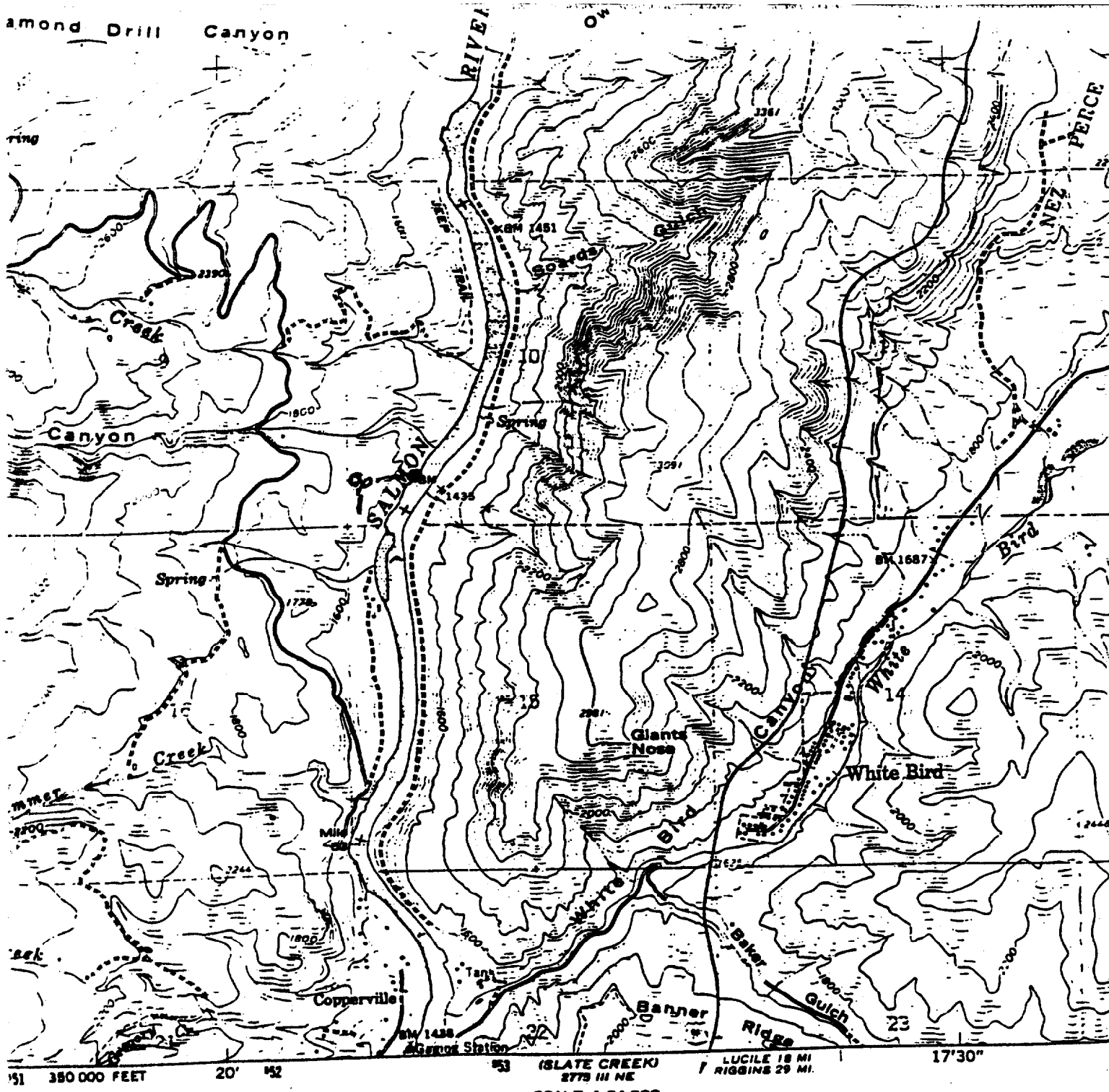
Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1994

Appendix B. Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1994.

Species	Location	UTM East	UTM North
Red-tailed Hawk	Across Snake River from Cottonwood Cr. (Oregon)	509850	5087950
Red-tailed Hawk	Pine Bar	552250	5081850
Golden Eagle	Snowhole Rapids	530700	5094800

Appendix C

Survey area maps



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1 MILE

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1 KILOMETER

CONTOUR INTERVAL 40 FEET

DOTTED LINES CROSSING RIVERS REPRESENT 20-FOOT CONTOURS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRID AND 1982 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092

A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

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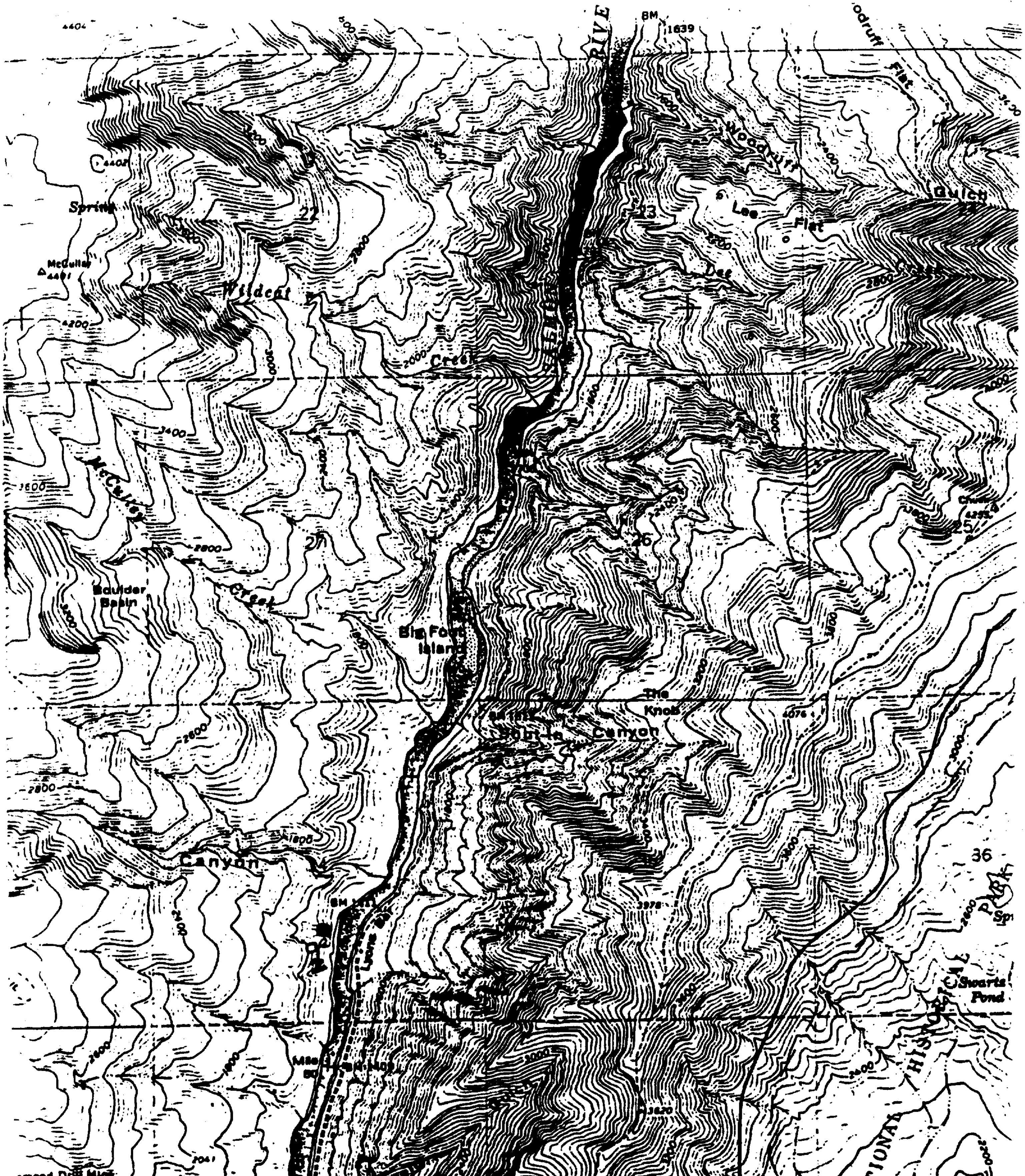

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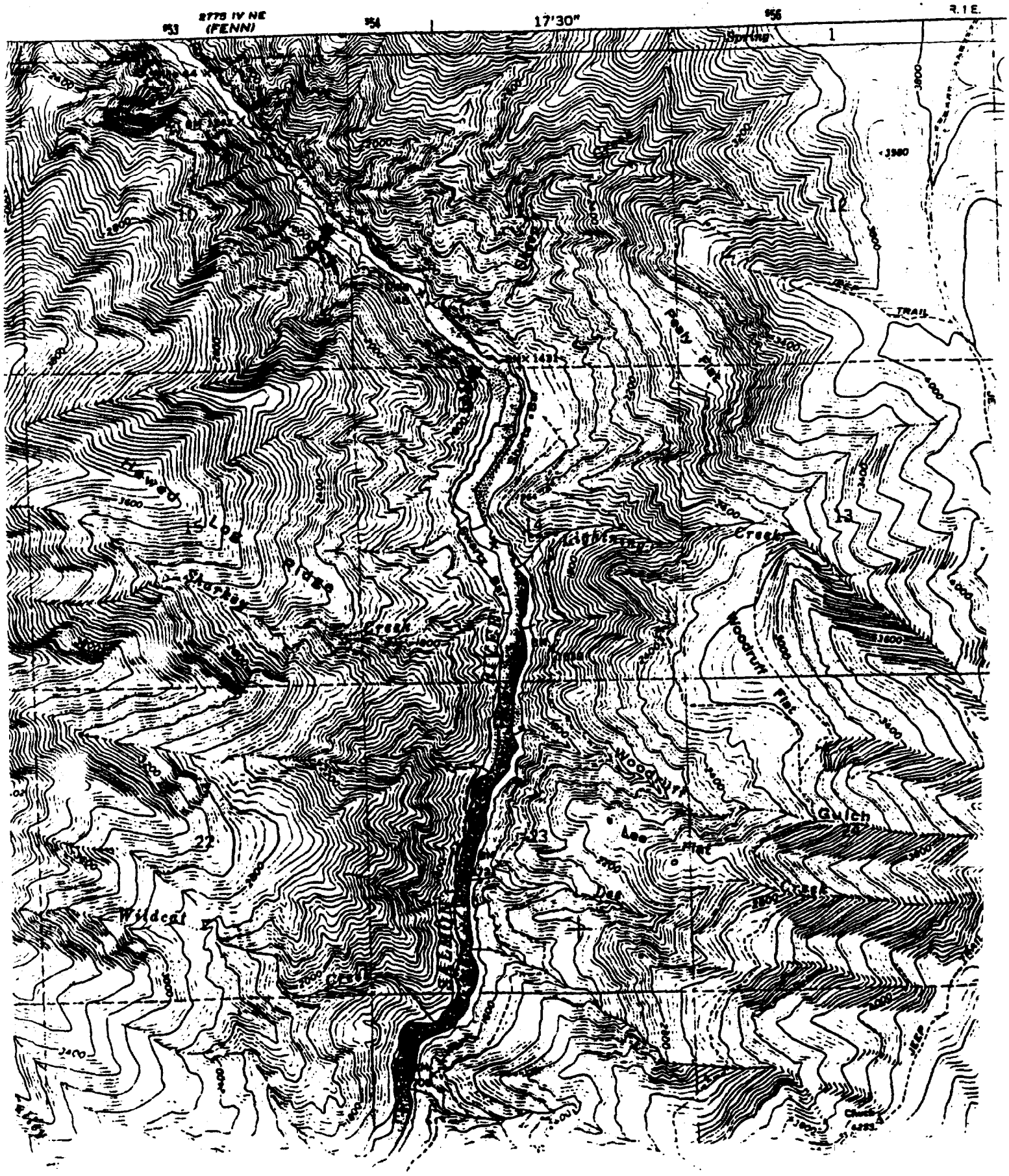

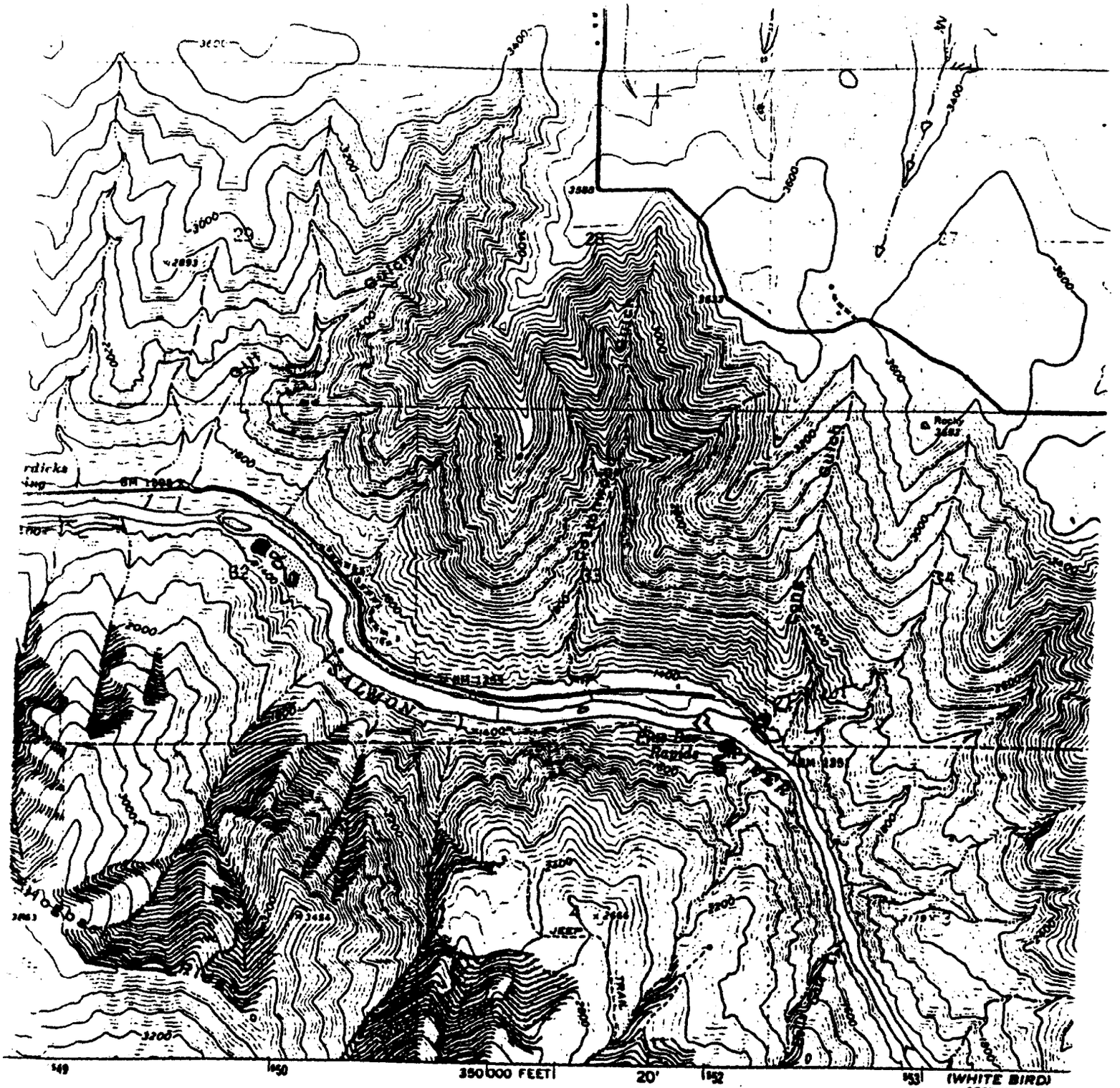

edited, and published by the Geological Survey

USGS and USC&GS

by photogrammetric methods from aerial
ons taken 1961. Field checked 1963

Projection, 1927 North American datum
Spot grid based on Idaho coordinate system, west zone
ster Universal Transverse Mercator grid ticks,
shown in blue

Dashed lines indicate selected fence lines

UTM GRID AND 1963 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 4
DOTTED LINES REPRESENT 20-F
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FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25,
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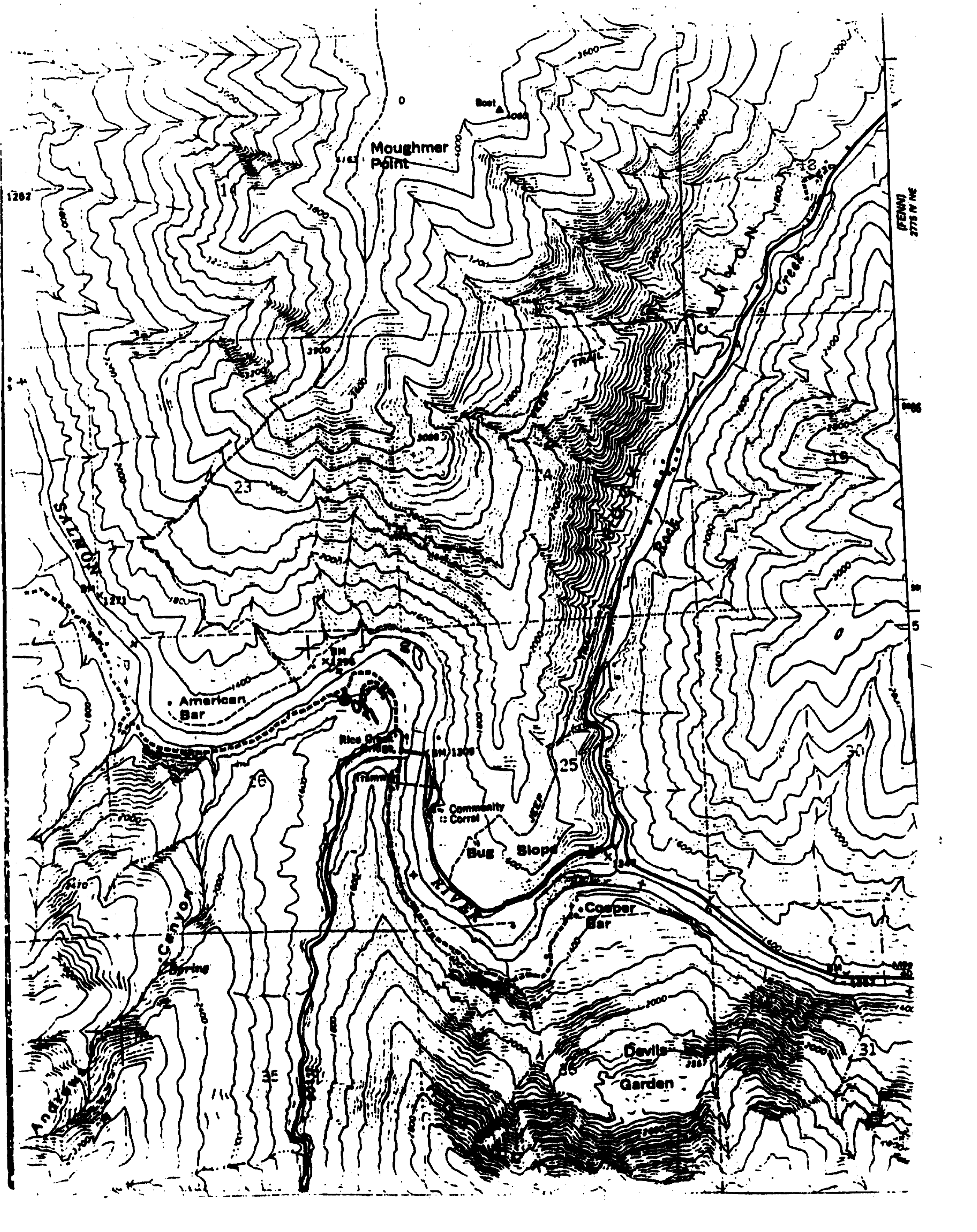
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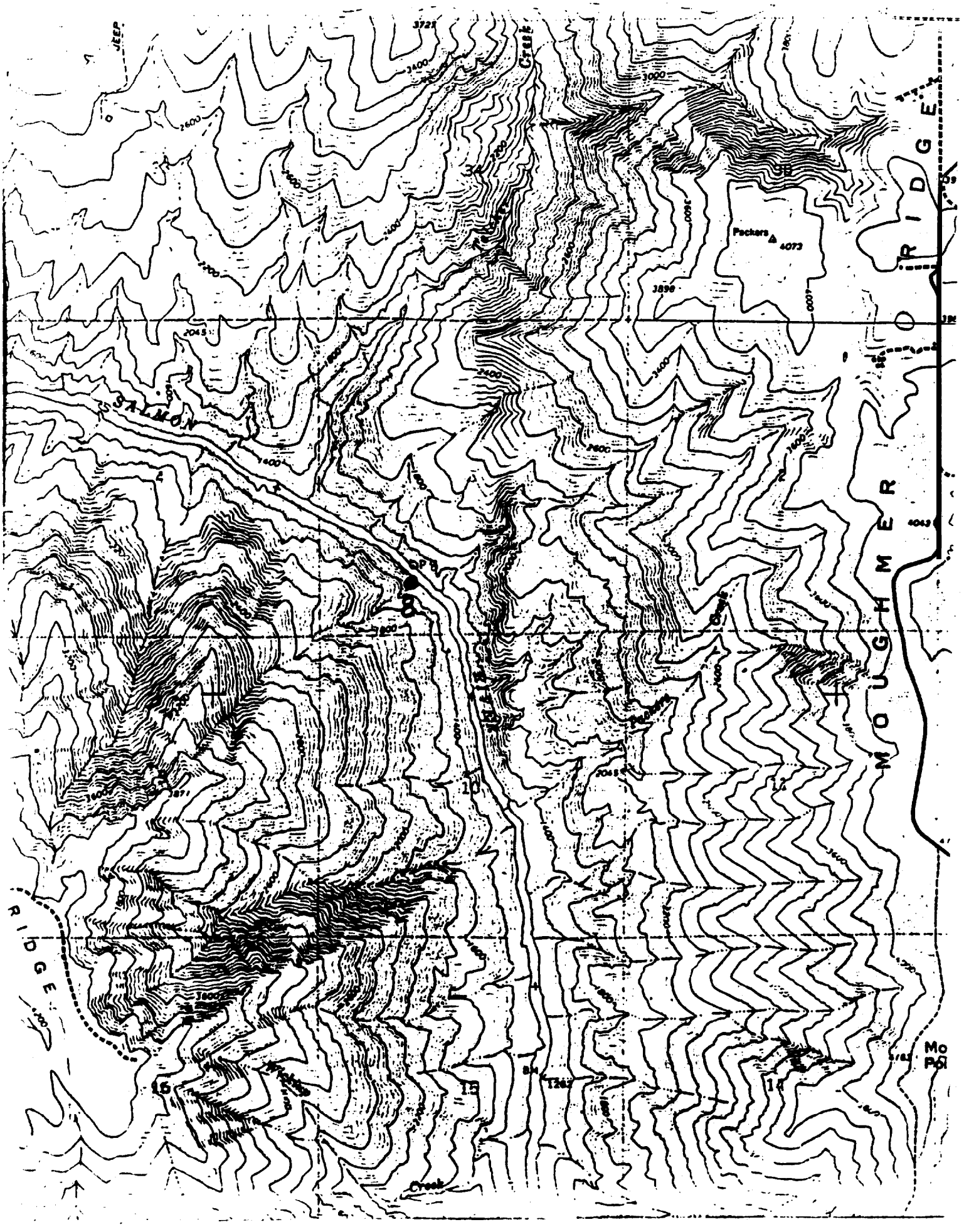
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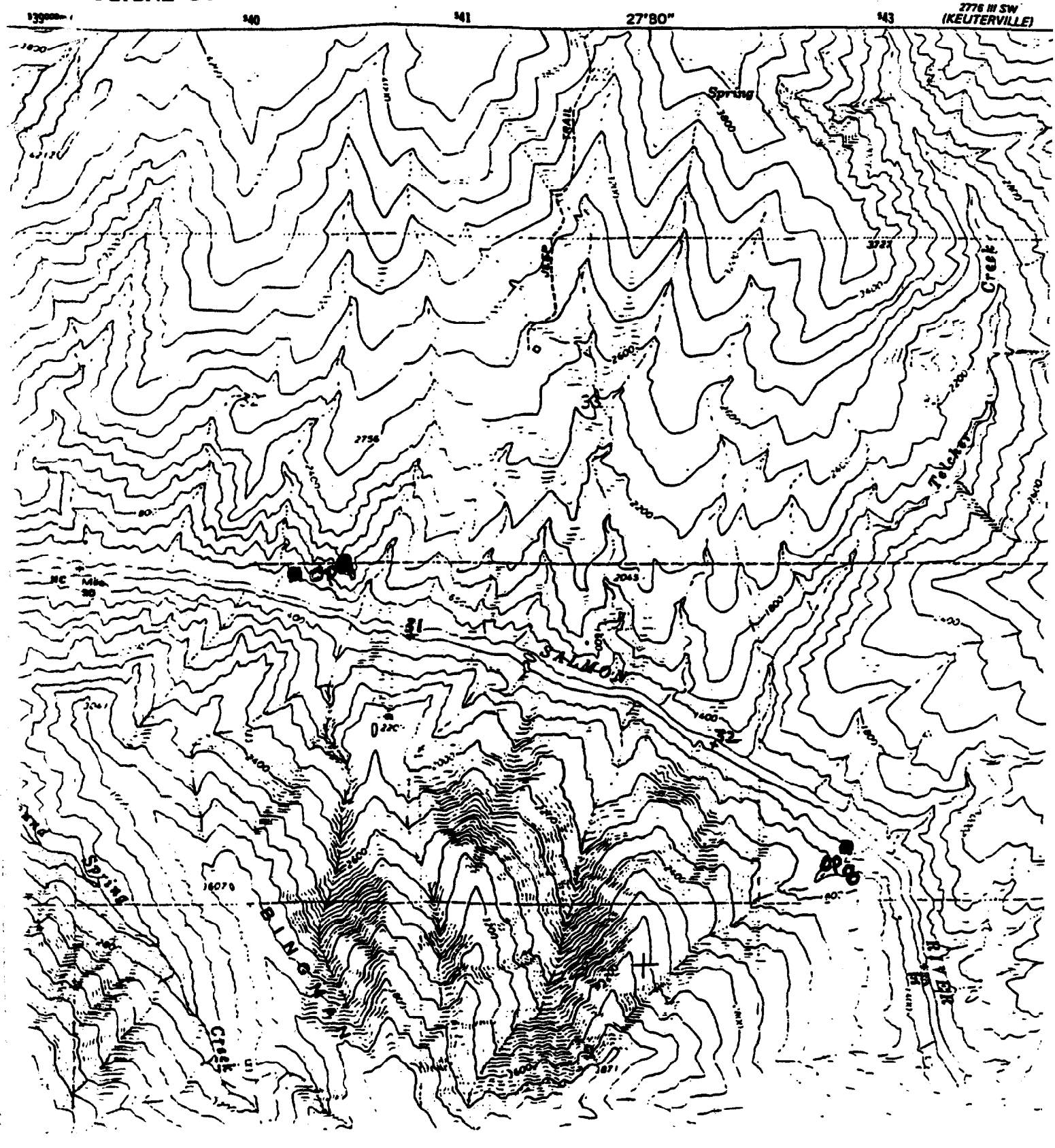
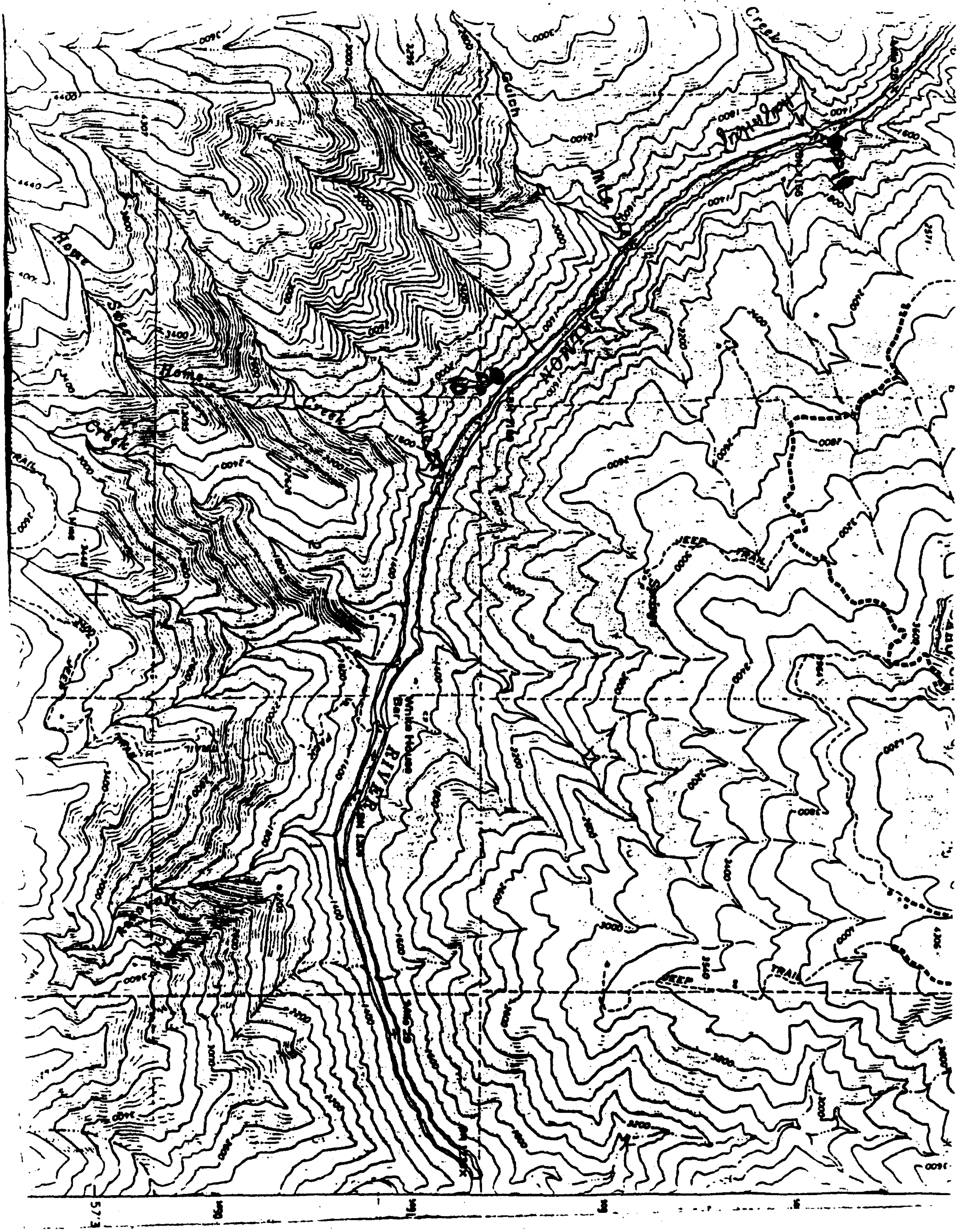
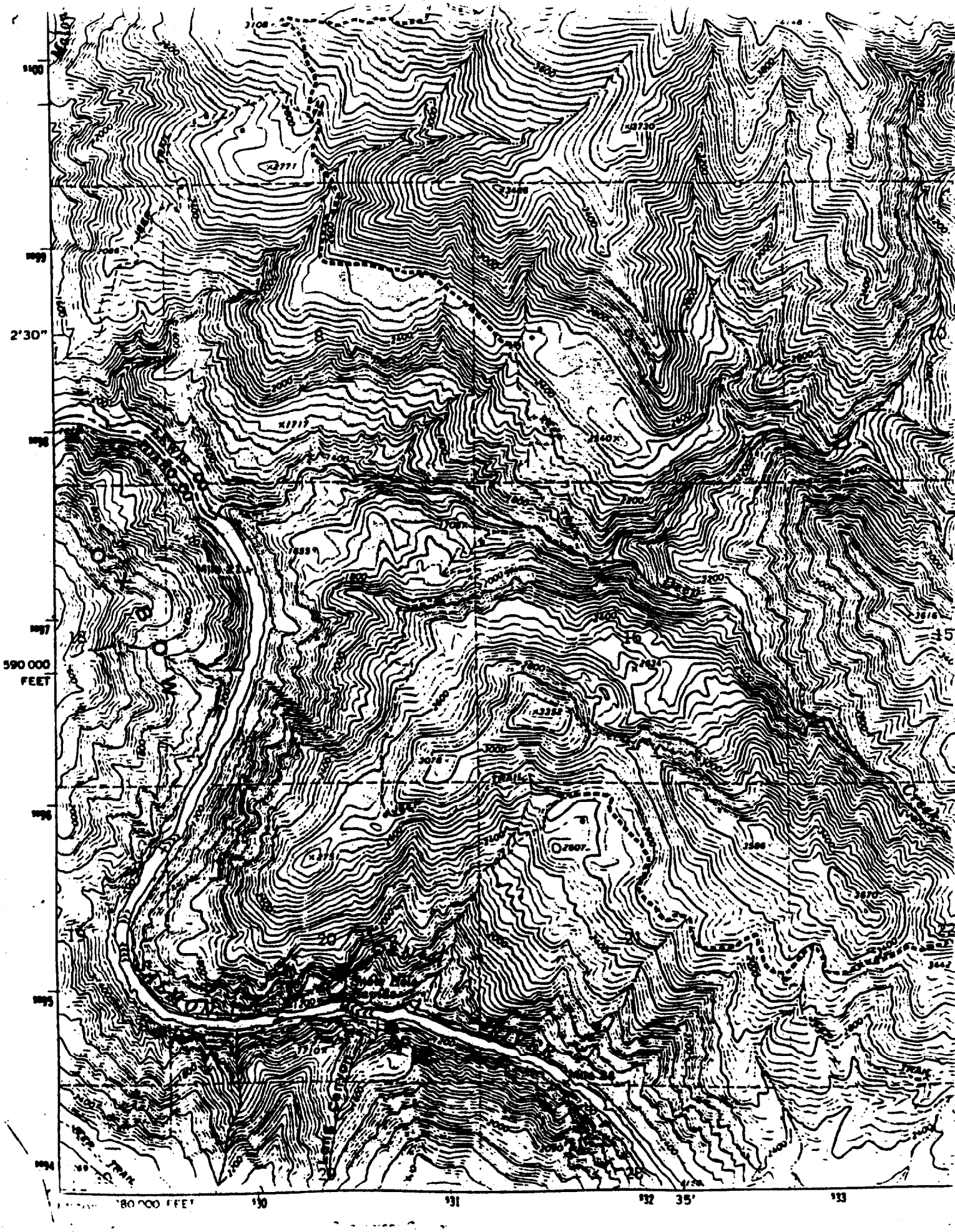
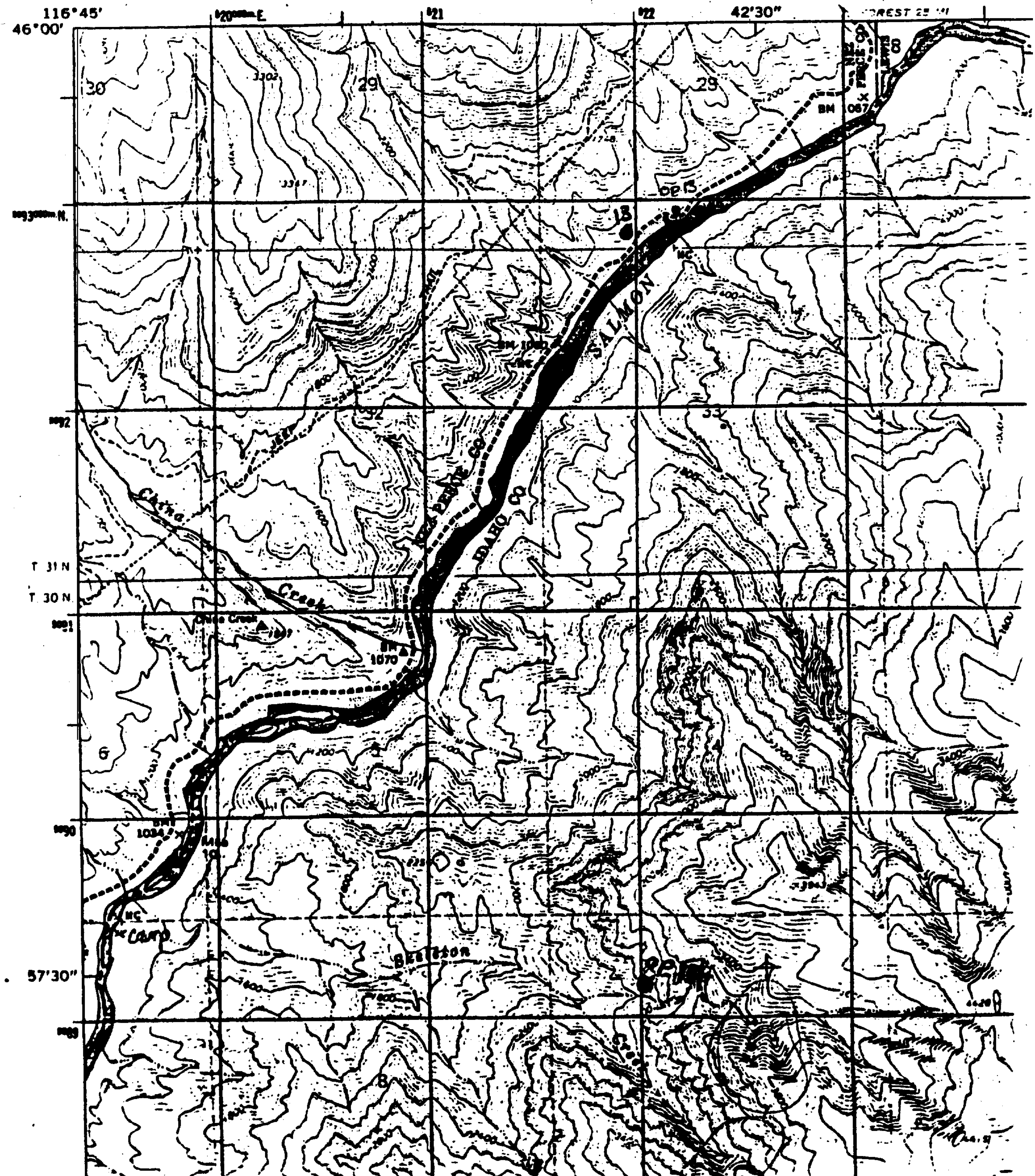
GEOLOGICAL SURVEY

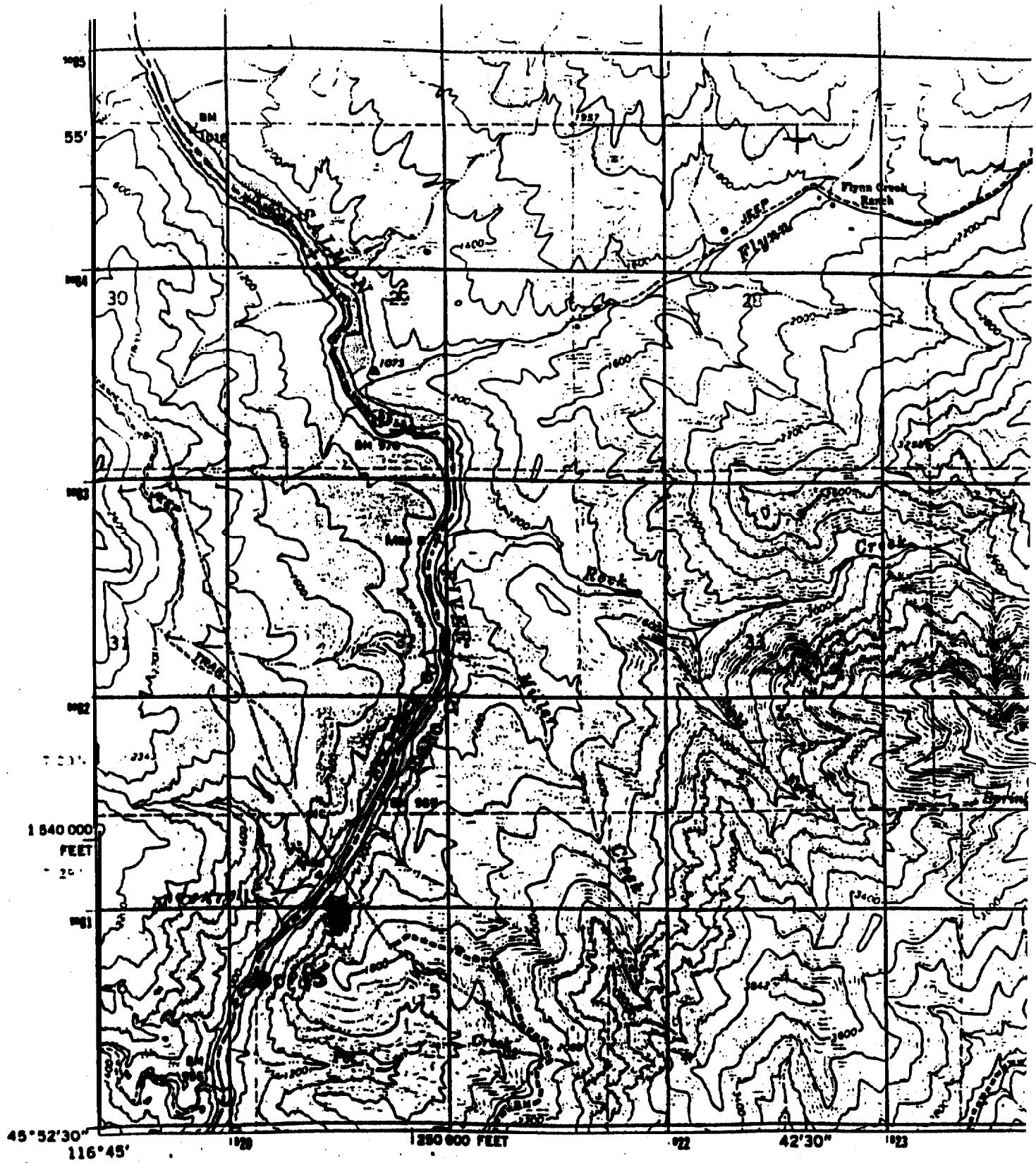



Creek
Gulch
TRAIL


2'30"
590 000
FEET
'80 000 FEET
35'

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY





Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

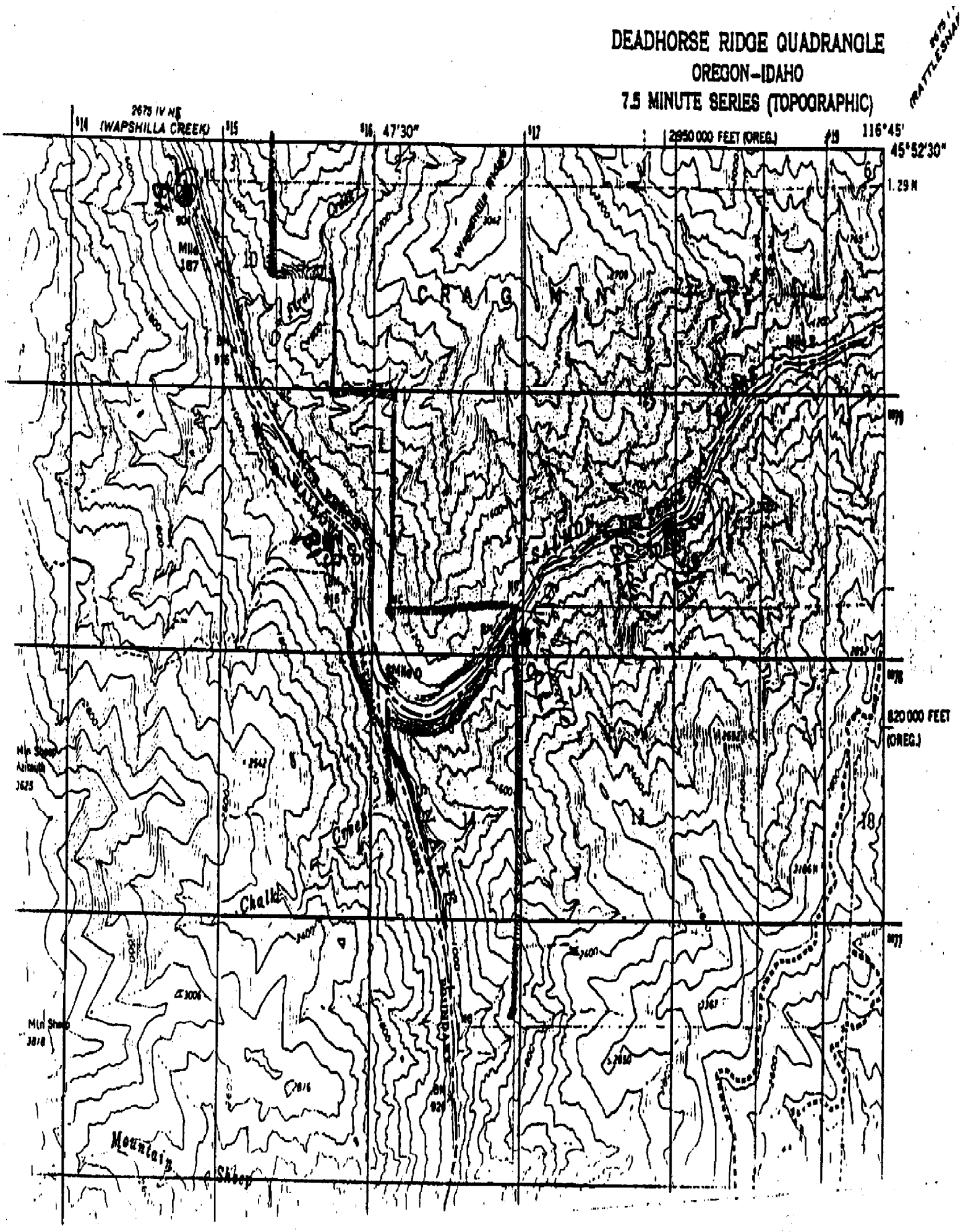
Topography by photogrammetric methods from aerial photographs taken 1961. Field checked 1963

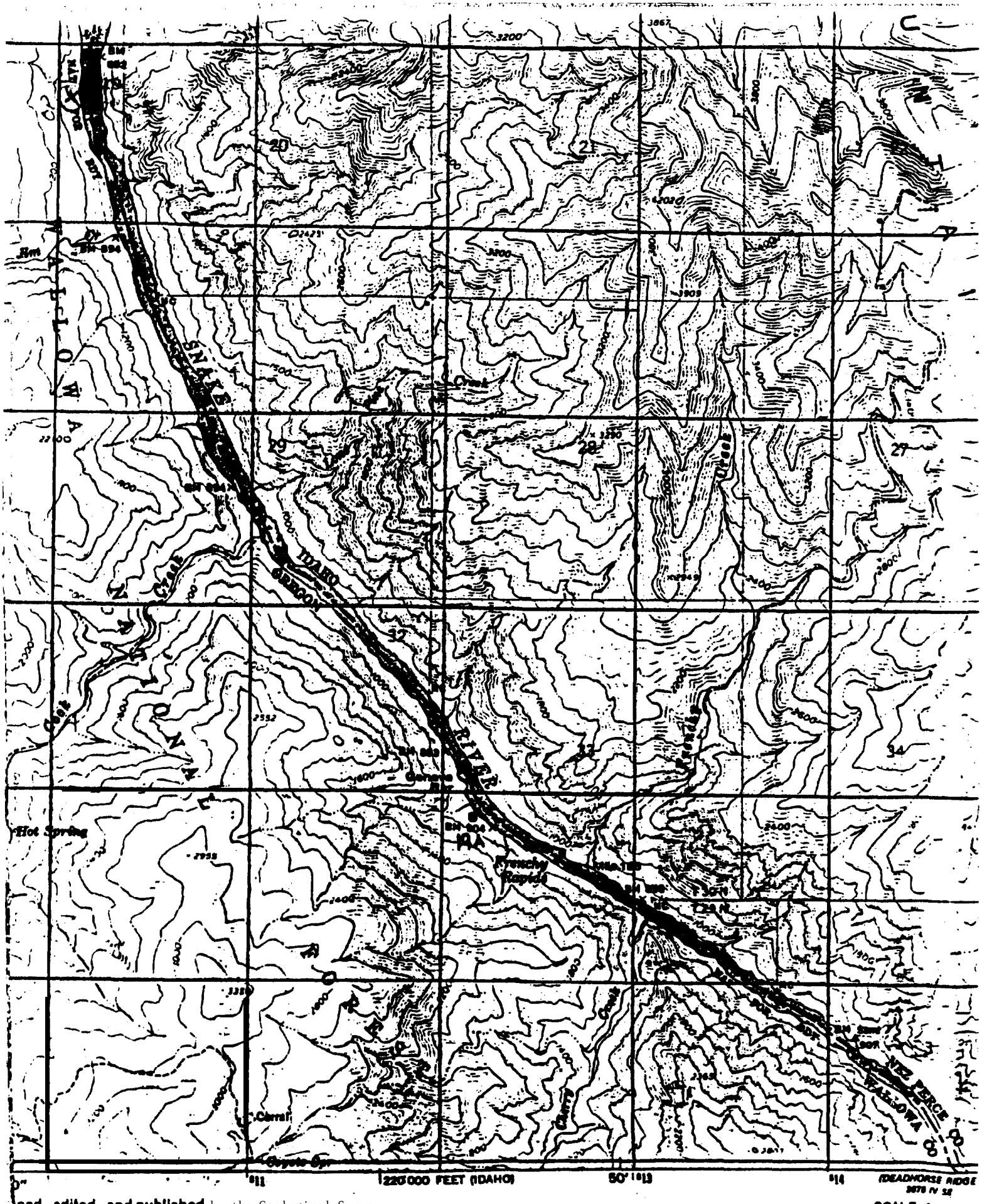
Polyconic projection. 1927 North American datum
10,000-foot grid based on Idaho coordinate system, west zone
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

UTM GRID AND 1963 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THIS MAP CO

FOR SALE BY U. S. GEOLOGIC


DEADHORSE RIDGE QUADRANGLE
OREGON–IDAHO
7.5 MINUTE SERIES (TOPOGRAPHIC)
2675 IV NE
(WAPSHILLA CREEK)
116°47'30"
2950 000 FEET (OREG.)
116°45'
45°52'30"
1.29 N
CRAG MTN
820 000 FEET
(OREG.)



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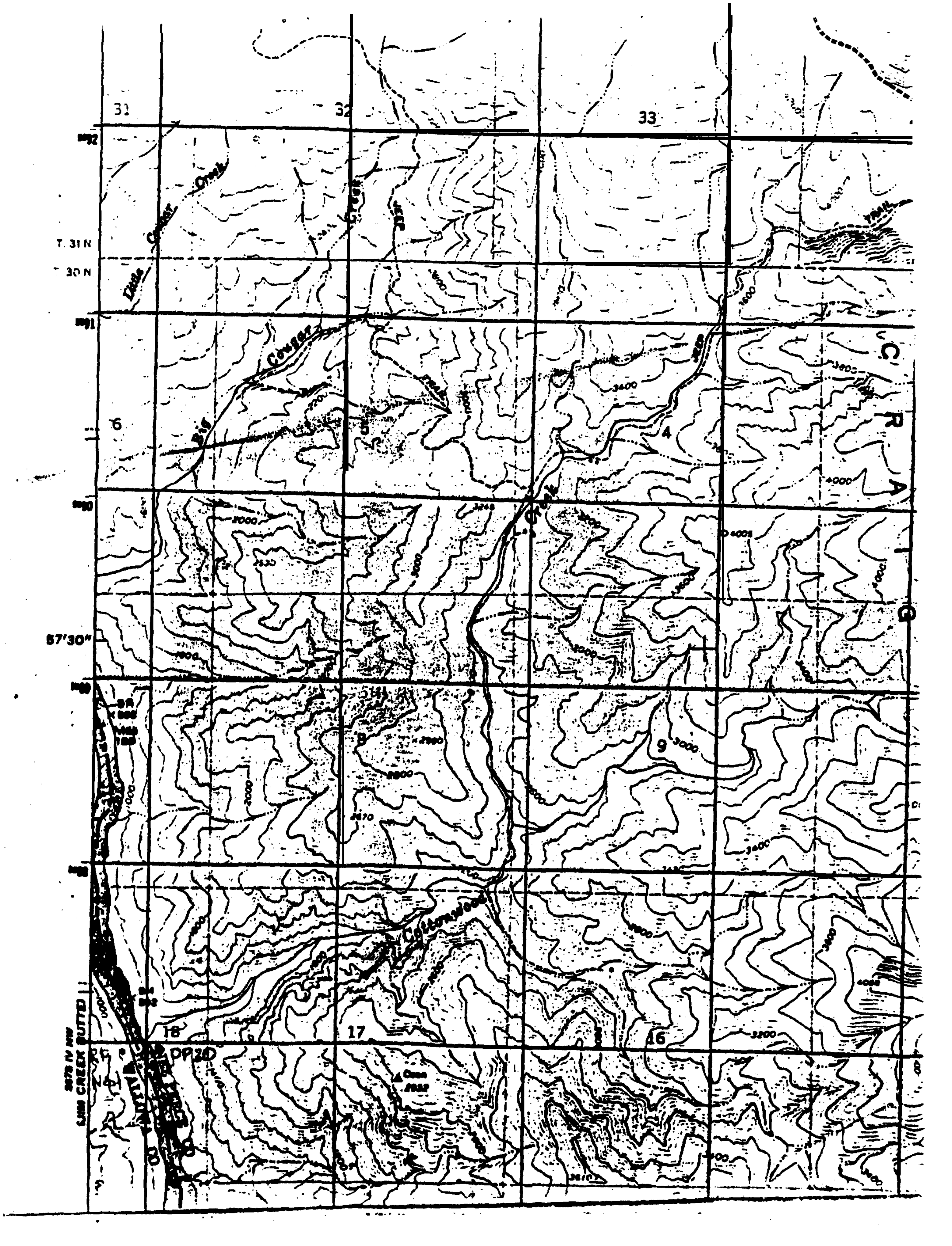
31
32
33
T. 31 N
T. 30 N
Little Cougar Creek
Big Cougar
6
5
4
C
R
A
G
57'30"
8
9
18
17
16
Cottonwood
CREEK BUTTE

APPENDIX C. Craig Mountain pitfall trapping raw data, 1993 and 1994.

Table 1. Numbers of small mammals captured at 12 pitfall trapping sites in 4 vegetation types at Craig Mountain, Idaho, Fall 1993.

SITE[1]	SPECIES[2]											
	TRAP NIGHTS	CLGA	MILO	MIMO	PEMA	PEPA	SOCI	SOME	SOMO	SOVA	THTA	TOTAL
AL1	312		62	36	33	-		1		13	-	145
AL2	324		14	18	30	-	1	1	-	3	-	67
AL3	324		2	5	13	-	-	1		1	-	22
DF1	348	1	3	6	8	-	1	-		3	-	22
DF2	312		10	5	16	-	2	-		5	-	38
DF3	312		11	13	3	-		-	-	1	-	28
IF1	288		4	33	11	1	0	2		17	-	68
IF2	332		2	15	15	1	0	5		6	1	45
IF3	279		8	26	13	-				5	2	54
WM1	279	1	19	31'	4	-	1	-	1	13	1	71
WM2	283		12	10	2	-	2	-		6	-	32
WM3	279		23	10	1	-	1	-	-	3	-	38
TOTAL	3681	2	170	208	149	2	10	10	1	76	4	630

[1]AL=White alder, DF=Douglas-fir, IF=Idaho fescue, WM=Wet meadows, YS=Yellow starthistle.

[2]CLGA=Clethrionomys gapperi, MILO=Microtus longicaudus, MIMO=Microtus montanus, PEMA=Peromyscus maniculatus, PEPA=Perognathus parvus, SOCI=Sorex cinereus, SOME=- - , SOMO=Sorex monticolus, SOVA=Sorex vagrans, THTA=Thomomys talpoides, ZAPR=Zapus princeps (in addition there were two Sorex sp. not included in this table, 1 from IF312 and 1 from WM313).

Table 2. Numbers of small mammals captured at 15 pitfall trapping sites in 5 vegetation types at Craig Mountain, Idaho, Spring 1994.

SITE[1]		SPECIES[2]											
	TRAP NIGHTS	CLGA	MILO	MIMO	PEMA	PEPA	SOCI	SOME	SOMO	SOVA	THTA	ZAPR	TOTAL
AL1	252	-	19	22	38	-	-	-	1	56	1	9	145
AL2	252	-	37	58	25	-	1	-	1	76	-	10	208
AL3	231	-	5	78	15	-	-	-		81	-	9	188
DF1	264	3	19	22	8	-	-	1	3	8	-		64
DF2	264	-	20	36	13	-	-	-	1	20	1	2	93
DF3	264	1	26	40	8	-	-	-	-	21	-		96
IF1	276	-	13	71	15	-	-	-	1	33	-	-	133
IF2	253	-	14	41	10	1	1	4		16	-	-	87
IF3	276	-	8	35	14	-		1	-	22	2		82
WM1	242	12	7	3	1	-	11	-	1	7	1	4	47
WM2	242	-		1	-	-	1	-		2	2	1	7
wM3	198	-	2	'5	-	-	5	-		6	-		18
YS1	252	-	8	13	35	-	1	1		33	-	8	99
YS2	252	-	15	19	47	-	-	-	-	15	-	8	104
YS3	252	-	9	33	13	-		-	-	10	2		67
TOTAL	3770	16	202	477	242	1	20	7	8	405	9	51	1438

[1]AL=White alder, DF=Douglas-fir, IF=Idaho fescue, WM=Wet meadows, YS=Yellow starthistle.

[2]CLGA=Clethrionomys gapperi, MILO=Microtus longicaudus, MIMO=Microtus montanus, PEMA=Peromyscus maniculatus, PEPA=Perognathus parvus, SOCI=Sorex cinereus, SOME=Sorex merriami, SOMO=Sorex monticolus, SOVA=Sorex vagrans, THTA=Thomomys talpoides, ZAPR=Zapus princeps (in addition there were eight Sorex sp. (5 IF312, 3 WM322) and 20 vole sp. (18 IF312, 1 DF121, 1 WM312) not included in this table).

Table 3. Nuinbers of **small** mammals captured at 7 snap'trap sites at Craig Mountain, Idaho, spring 1994.

SITE'	TRAP NIGHTS	SPECIES[2]						
		CLGA	MILO	MIMO	PEMA	SOPA	SPCO	TOTAL
BMS	100	7	-	-	4		-	11
BM	20	-		-			1	1
BMN	100	8	2	-	6	-	-	16
EC1	40	-	3	-	2	-	-	5
EC2	32	-	4	-	7	3	-	14
EC3	32	-	1	-	15	-	-	16
EC4	52	-	-	-	16	-	-	16
WR	160	-	4	7	47	-	-	58
TOTAL		15	14	7	97	3	1	137

[1] BMS = Forest south of Benton Meadows, BM = Benton Meadows, BMN = Forest north of Benton Meadows, EC1-4 = Upper Eagle Creek, WR = Wapshilla Ridge.

[2] CLGA = Clethrionomys gapperi, MILO = Microtus longicaudus, MIMO = Microtus montanus, PEMA = Peromyscus maniculatus, SOPA = Sorex palustris, SPCO = Spermophilus columbianus (three unidentified vole sp. from BMN were not included in this table).

APPENDIX D

WILDLIFE INVENTORY' AND MONITORING DATA SHEETS

CRAIG MOUNTAIN BREEDING BIRD SURVEY FORM

DATE	ROUTE	VISIT	OBSERVER	START TIME	STOP TIME

CLOUD COVER		WIND		TEMPERATURE		PRECIPITATION	
BEG	END	BEG	END	BEG	END	BEG	END

PAGE OF

STATION	TIME	SPECIES 0-3 MIN	SPECIES 3-B MIN	SPECIES B-10 MIN	DISTANCE	TYPE	ACT.	SEX	HAB.

COMMENTS:

CODES

VISIT

1 - 1st visit
2 - 2nd visit
3 - 3rd visit

DATE

Example

06/01/93

START TIME

Fill in time survey begun.

STOP TIME

Fill in time survey ended.

CLOUD COVER

1 - Clear
2 - Scattered clouds (< 50%)
3 - Scattered clouds (> 50%)
4 - Unbroken clouds

WIND

Enter code that best describes wind condition at start and end of censusing. See Beaufort Scale of Wind Force.

TEMPERATURE

Temperature in degrees Fahrenheit.

PRECIPITATION

1 - None
2 - Occasional showers
3 - Constant light rain

TYPE

A - Aural
V - Visual
B - Both

ACTIV.

D - Drumming
C - Calling
S - Singing
P - Perched
Y - Flying
0 - Flyover
F - Foraging
N - Nesting
J - With juveniles

HABITAT

S - Shrub
0 - Open
R - Riparian
G - Grand fir or mixed conifer
P - Ponderosa Pine or Douglas fir

SPECIES 0 - 3 MIN

Enter all species observed in the first 3 minutes.

SPECIES 3 - 5 MIN

Enter all additional species observed in the next two minutes.

SPECIES 5 - 10 MIN

Enter all additional species observed in the last five minutes.

CRAIG MOUNTAIN WMA ANIMAL OBSERVATION REPORT

Observer(s): _____ Phone:( ) _____

Address: _____

_____

Species: _____

Number: _____ Sex: _____

Date of Observation: _____ Time: _____

Location: _____

UTMN: _____ UTME: _____ Quad: _____

Township: _____ Range: _____ Section: 1/4: _____

Type of observation (tracks, scat, call, nest, sighting): _____

_____

Habitat Description: _____

Other Comments: _____

_____

Species: _____

Number: _____ sex: _____

Date of Observation: _____ Time: _____

Location: _____

UTMN: _____ UTME: _____ Quad: _____

Township: _____ Range: _____ Section: _____ 1/4: _____

Type of observation (tracks, scat, call, nest, sighting): _____

_____

Habitat Description: _____

Other Comments: _____

NATIONAL **WILDLIFE FEDERATION**
MIDWINTER BALD EAGLE SURVEY
STANDARDIZED SURVEY FIELD FORM

Survey Site Location **Survey Site Number:** _____

1. State(s): _____ 2. County: _____

3. Drainage or Body of Water: _____

4. Site Name: _____

Observers

1. Name of Recorder: _____ 2 No. of Observers: _____

3. Address: _____

4. Phone: ( ) 5. Affiliation: _____

Survey Site Oescrlptlon and Survey Condltlons

1. Vegetation Type(s) at Survey Site: _____

2. A. Overall Prey Availability (*Circle* One): Very Low Low Normal High Very High

B. Types of Prey Available: _____

3. A. Gen. Weather & Ice Conditions: _____

B. Weather (*Circle* One): Very Mild Mild Normal Harsh Very Harsh

c. Ice (*Circle* One): Much Less Than Normal | Less Than Normal | Normal | More Than Normal | Much More Than Normal

D. Percentage of Ice Cover over Entire Survey Route: _____ %

4. Survey Date: _____ 5. Time at Start: _____

6. Total Time of Survey (min.): _____ 7. Roost or Nonroast? _____ _____

8. Continuous Route or Fixed Point? _____

9. Survey Method (*Circle All That Apply*): Road Vehicle *Foot* Travel Fixed Wing Snowmobile Helicopter Other _____ Boat

Survey Results

1. Total Bald Eagles Counted: _____ No. of Adults: _____ No. of Immatures: _____
No. of Unknown Age: _____

2. Total Golden Eagles Counted: _____ No. of Adults: _____ No. of Immatures: _____
No. of Unknown Age: _____

Comments: _____